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# A FLORA OF CALIFORNIA

BY  
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Assistant Professor of Dendrology in the  
University of California

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## ABBREVIATIONS

*Bibliog.*—General references to literature.

*Refs.*—Citations of special and of synonymic or critical discussions of those.

*Locs.*—Specific localities where the species has been collected.

*Co.*—County.

*Acc.*—According to

*Var.*—Variety

*F.*—Form.

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FIG. 61. *ALNUS RHOMBIFOLIA* Nutt. Typical growth along stream. Tributary of Sonoma Creek near Glen Ellen.

## DICOTYLEDONS.

Leaves netted-veined. Stem increasing in diameter by an annual layer of wood inside the bark. Flowers with the parts in 4s or 5s, the perianth commonly differentiated into calyx and corolla, sometimes absent. Embryo with 2 cotyledons.

## CHORIPETALAE.

Calyx usually present, sometimes petal-like. Corolla present or absent, when present consisting of distinct or nearly distinct petals.

## SALICACEAE. WILLOW FAMILY.

Trees or shrubs of rapid growth, light wood and bitter bark. Leaves simple and alternate, with stipules. Flowers dioecious, borne in catkins, these falling off as a whole, the staminate after shedding the pollen, the pistillate after ripening of the fruit and dispersion of the seeds. Bracts of the catkin scale-like. Calyx and corolla none. Stamens 1 to many. Ovary 1-celled; stigmas 2. Fruit a 2 to 4-valved capsule, enclosing many seeds furnished with a tuft of hairs at base.—Two genera.

Bibliog.—Anderson, N. J., *Monographia Salicum* (1867). Watson, S., *Poplars of North America* (Am. Jour. Sci. vol. 15, p. 135,—1878). Bebb, M. S., *Review of the Willows of California* (Bot. Gaz., vol. 16, p. 102,—1891). Rydberg, P. A., *Cespitose Willows of Arctic America and the Rocky Mts.* (Bull. N. Y. Bot. Gard. vol. 1, p. 257,—1899). Rowlee, W. W., *North American Willows, Longifoliae* (Bull. Torr. Club. vol. 27, p. 247,—1900). Jones, M. E., *Willow Family of the Great Plateau* (1908).

Scales entire or merely denticulate, persistent; flowers without disk; stamens usually 1 to 5; stigmas short; pods small, ovate or narrow.....1. *SALIX*.  
Scales fimbriate or lacerate, caducous; flowers with a broad disk; stamens usually numerous; stigmas elongated or conspicuously dilated; pods larger, nearly globose....2. *POPULUS*.

1. *SALIX* L. WILLOW.

Trees or shrubs with mostly narrow short-petioled leaves. Winter buds covered by a single scale. Catkins mostly erect, appearing before or with the leaves; scales entire or merely denticulate, persistent or at least not caducous. Staminate flowers with 1 to 9 stamens and 1 or 2 little glands. Pistillate flowers with a gland at the base of the ovary. Stigmas short.—Mainly north temperate and arctic, 160 species. (Ancient Latin name of the willow.)

Stamens 3 to 9, their filaments hairy or woolly below; style short; stigmas roundish, subentire; scales pale or yellowish, in the pistillate catkin more or less deciduous by maturity; capsules pedicel; trees, mainly of lower altitudes.

Petioles with wart-like glands at summit; leaves lanceolate, long-pointed; stipules usually present, roundish; catkins in bud tapering, in flower usually straight, their scales erect. ....1. *S. lasiandra*.

Petioles not glandular; stipules usually absent; catkins in bud cylindric.

Leaves broadly lanceolate, acute, usually glaucous beneath; staminate catkins curving; scales reflexed or spreading .....2. *S. laevigata*.

Leaves very narrow, nearly alike on both faces, finely serrulate, often curving towards apex. ....3. *S. nigra*.

Stamens 2, their filaments woolly or hairy below; scales pale, somewhat deciduous; catkins borne on short leafy branchlets, often clustered; leaves linear or lanceolate; shrubs of stream beds at lower altitudes.

Stigmas linear, raised on a distinct style; ovary densely silky; leaves silvery or green. ....4. *S. sessilifolia*.

Stigmas oblong or roundish, sessile.

Capsule glabrous; leaves green, remotely serrulate.....5. *S. longifolia*.

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- Capsule more or less pubescent; leaves more or less white-silky, entire.....  
 ..... *Var. argyrophylla*.
- Stamens 2 (rarely 1), their filaments glabrous; stigmas entire or notched, rarely parted into linear lobes; scales usually black or dark-colored, mostly persistent.
- Capsules glabrous.
- Leaves dark green above, white-pubescent beneath; catkins sessile, leafless; filaments more or less united; small tree or shrub; foothills mainly, common. 6. *S. lasiolepis*.
- Leaves light green, nearly alike on both faces; catkins shortly peduncled and leafy bracteate; filaments distinct or partly united; montane, rare with us. ....  
 ..... 7. *S. cordata*.
- Capsules tomentose, silky or puberulent.
- Style none.
- Leaves obovate; catkin-scales black, with white hairs..... 8. *S. flavesces*.
- Leaves lanceolate; catkin-scales tawny ..... 9. *S. macrocarpa*.
- Style evident.
- Stamen 1, or if 2 the filaments partly united; stigmas linear; leaves conspicuously silky beneath ..... 10. *S. sitchensis*.
- Stamens 2; stigmas short.
- Montane species; good sized shrubs; leaves entire or nearly so.
- Leaves glabrate beneath; catkins appearing with the leaves, borne on short leafy peduncles; Sierra Nevada ..... 11. *S. lemmoni*.
- Leaves glaucous-pubescent beneath, long and narrow; catkins appearing before the leaves, sessile; inner South Coast Range..... 12. *S. breweri*.
- Alpine species; low shrubs or dwarfs.
- Capsule shortly pediceled, at least pistillate catkins on short leafy branchlets.
- Ovary hoary or finely tomentulose.
- Leaves entire, usually green and glabrate..... 13. *S. glauca*.
- Leaves serrulate, usually gray-villous, the bract-like leaves glandular-serrulate ..... 14. *S. californica*.
- Ovary glabrous; leaves bright green, dark veined..... 15. *S. barclayi*.
- Capsule sessile, 2 lines long; catkins short, sessile or subsessile..... 16. *S. monica*.
- Capsule subsessile, 2 to 3 lines long; catkins terminal on short leafy branches; plant body forming a more or less dense mat..... 17. *S. tenera*.

1. ***S. lasiandra* Benth.** YELLOW WILLOW. Tree 20 to 45 feet high, the trunk with brown roughly fissured bark; one-winter-old branchlets yellowish; winter buds keeled on the back, short and blunt; young leaves lanceolate or oblanceolate, acuminate, glandular-serrulate, with small suborbicular stipules; mature leaves lanceolate with long tapering or very slender point, 4 to 7 inches long,  $\frac{5}{8}$  to  $1\frac{1}{4}$  inches wide; petioles 3 to 9 lines long, glandular at the upper end; stipules on vigorous shoots conspicuous, orbicular, 5 to 12 lines broad; staminate catkins  $1\frac{1}{4}$  to 3 inches long, usually straight, 5 to 6 lines thick; pistillate catkins  $1\frac{1}{4}$  to  $2\frac{1}{4}$  inches long,  $2\frac{1}{2}$  to 3 lines thick; scales erect, oblong-lanceolate, thin, nearly or quite glabrous on the back, hairy at base, the staminate yellow, the pistillate brown and mostly deciduous in fruit; stamens 4 to 9; ovary and capsule glabrous.

Banks of living streams throughout the Coast Ranges, Sacramento and San Joaquin valleys, and Sierra Nevada southward to Southern California and northward to British Columbia and Idaho. In the Sierra Nevada it is found chiefly in the foothills but ranges as high as 4,500 feet at the north and 8,500 feet at the south. Also called "Waxy Willow" and "Western Black Willow."

Refs.—*SALIX LASIANDRA* Benth, Pl. Hartw. p. 335 (1857), type loc. Sacramento River between Sacramento and Marysville, *Hartweg*; Jepson, Fl. W. Mid. Cal. p. 136 (1901).

2. ***S. laevigata* Bebb.** RED WILLOW. Tree 20 to 50 feet high, the trunk bark roughly fissured; one-winter-old branchlets reddish brown; winter buds ovate, pointed; young leaves broadly oblong, acute at each end, disposed to be broadest above the middle, mucronate, entire, soon becoming serrulate;



stipules minute and caducous or none; mature leaves oblong-lanceolate to lanceolate, obtusish at base, acute at apex or sometimes long-pointed, serrulate, glabrous, green and shining above, pale or conspicuously glaucous beneath,  $2\frac{1}{2}$  to  $7\frac{1}{2}$  inches long,  $\frac{5}{8}$  to  $1\frac{1}{4}$  inches broad; petioles 1 to 5 lines long; staminate catkins commonly flexuous,  $1\frac{1}{2}$  to  $4\frac{1}{2}$  inches long, 4 or 5 lines thick; pistillate catkins  $\frac{3}{4}$  to 2 inches long, 2 lines thick; scales soon spreading or reflexed, elliptic, blunt, woolly at base, glabrous and pallid towards apex, 2 to 4-toothed, the staminate yellow, the pistillate gray and tardily deciduous; stamens 4 to 7 (sometimes 3); ovary and capsule glabrous.

Coast Ranges, Sacramento and San Joaquin valleys, Sierra Nevada (especially the foothills) and southward to Southern California. Usually along living streams, ranging altitudinally from near sea-level to 4,500 feet in the southern Sierra Nevada. Also called Bebb Willow, Smooth Willow and Spotted-leaf Willow. Extends north to southern British Columbia.

Forma *araquipa* Jepson n. form. Small tree; one-year-old shoot with dense close tomentum; brown tuft of hairs on old wood at base of season's shoot very conspicuous; leaves reddish brown above; catkins long and dense.—(Arbor parva ramulis annotinis cum denso appresso tomento; valde manifestus caespes fuscii pili basi horni ramuli in ligno vetere; folia rufo-fusca supra; amenta longa artaque).—Dry gulches, Araquipa Hills, Solano Co., May 2-6, 1891, W.L.J.

Refs.—*SALIX LAEVIGATA* Bebb, Am. Nat. vol. 8, p. 202 (1874); Jepson, Fl. W. Mid. Cal. p. 136 (1901). Bebb had his original specimens from Santa Cruz, Ukiah and Alameda Co.

3. *S. nigra* Marsh. BLACK WILLOW. Tree commonly 20 to 50 feet high with rough dark bark; branchlets brittle at the base; mature leaves narrowly lanceolate, long-pointed, often falcate, serrulate, glabrous, green on both surfaces, 2 to 7 inches long, 2 to 4 (or 8) lines wide; petioles 1 line long; stipules early deciduous; scales of catkins obovate, yellow, hairy, erect; staminate catkins  $1\frac{1}{2}$  to  $2\frac{1}{2}$  inches long; stamens 3 to 5; pistillate catkins  $\frac{3}{4}$  to  $1\frac{1}{4}$  inches long, in fruit 1 to  $2\frac{1}{2}$  inches long, becoming rather lax; ovary scantily pubescent or hoary; capsule glabrous, reddish brown.

River banks in the Sacramento and San Joaquin valleys, extending into the lower Sierra Nevada foothills, ranging southward to Southern California and following the desert rivers across the Mojave to southern Arizona, thence eastward to the Mississippi Valley and north to New Brunswick. It has a more extensive range than any other tree in the United States except the Aspen.

Refs.—*SALIX NIGRA* Marsh, Arbust. Am. p. 139 (1785); Jepson, Fl. W. Mid. Cal. p. 136 (1901.)

4. *S. sessilifolia* Nutt. SANDBAR WILLOW. Shrub with slender stems 5 to 14 feet high, or becoming a tree up to 25 feet high; foliage silvery or becoming more or less green; leaves linear, usually tapering to the acute apex and to the narrow but short petiole-like base, entire, 1 to 3 inches long, 2 to 4 lines broad, thinly villous on both surfaces and green, or densely villous and silky, especially on young or sterile shoots; no stipules; catkins on leafy peduncles; staminate catkins  $\frac{1}{3}$  to 1 inch long, slender (2 lines thick), in bud usually cylindric, the scales with acute green tips; gland long and slender; pistillate catkin  $\frac{3}{4}$  to 1 inch long, 3 lines broad, often not dense; ovary sessile, densely silky; style present, stigmas linear; capsule densely silky, or glabrescent and brown.

Abundant in stream beds of the Coast Ranges, Great Valley and Sierra Nevada foothills, ranging northward into Oregon.

Refs.—*SALIX SESSILIFOLIA* Nuttall, Sylva, vol. 1, p. 68 (1842), type loc. mouth of the Willamette River, Nuttall. *S. parishiana* Rowlee, Bull. Torr. Club, vol. 27, p. 249 (1900).

5. ***S. longifolia* Muhl. LONGLEAF WILLOW.** Shrub 5 to 15 feet high with bright green foliage; leaves mostly glabrous, or sometimes minutely canescent, lanceolate or linear, tapering to apex and to a short petiole at base, remotely serrulate with cuspidate teeth,  $\frac{3}{4}$  to 5 inches long, 2 to 4 lines broad; catkins terminal on leafy branches; staminate catkins  $\frac{1}{2}$  to  $1\frac{1}{8}$  inches long, 2 lines thick; pistillate catkins  $\frac{1}{2}$  to 1 inch long; ovary pediceled or sometimes nearly sessile, glabrous; stigmas very short, sessile; scales densely woolly; capsule glabrous; fruiting catkin  $1\frac{1}{4}$  to  $2\frac{1}{2}$  inches long.

Stream beds in valleys and foothills throughout the State and into the mountains to 4,000 feet, north to the Klamath River (W.L.J. no. 2952) and far eastward.

Var. ***argyrophylla* And. COYOTE WILLOW.** Slender shrub, stem one from the base, strictly erect or sometimes straggling, 4 to 12 feet high; foliage lustrous silvery or glabrescent and green; leaves linear, acute at apex or long-pointed, entire,  $\frac{3}{4}$  to  $2\frac{1}{2}$  inches long, 1 to 2 lines wide; catkins on leafy peduncles; staminate catkins  $\frac{1}{3}$  to  $1\frac{1}{4}$  inches long, 3 lines thick, in bud usually conical, the green-tipped scales often abruptly acute; pistillate catkins  $\frac{1}{3}$  to  $\frac{3}{4}$  inch long,  $1\frac{1}{2}$  to 2 lines thick; ovary silky; stigmas oblong, sessile, the top of the ovary sometimes bulbous-dilated just below them; capsule glabrescent, brown.—Stream beds, South Coast Ranges and northward to Oregon. Our description resting chiefly on Priest Valley plants (W.L.J. no. 2674) which in appearance more nearly resemble *S. sessilifolia*.

Refs.—*SALIX LONGIFOLIA* Muhlenberg in Ges. Naturf. Fr. Neue Schr. vol. 4, p. 238 (1803). *S. fluviatilis* Nuttall, Sylva, vol. 1, p. 73 (1842) is dubious. Nuttall collected his type on the banks of the Columbia River near the mouth of the Willamette. "At the present time the only species collected at or near that point are *S. sessilifolia* and *S. exigua*. \* \* \* There is no Nuttallian type to represent this species in the Philadelphia Academy and it is therefore probably not in existence."—C. V. Piper in litt., 1908. *S. bolanderiana* Rowlee, Bull. Torr. Club, vol. 27, p. 257 (1900), with citation of Bolander's nos. 4958 (Yosemite Valley) and 5031 (Clarks, Merced River) as part of type, but no. 5031 also cited under *S. exigua* virens Rowlee, 1 c. p. 255, and no. 4958 under *S. argophylla*, p. 251, as if it were Brewer's number.

Var. ***ARGYROPHYLLA* Andersson, Monog. Sal. p. 55 (1867),** rests on Nuttall's *S. argophylla*. The original specimens of *S. argophylla* Nuttall, Sylva, vol. 1, p. 71, t. 20 (1842), were collected by Nuttall on the Boise River, Idaho, near its confluence with the Snake.

6. ***S. lasiolepis* Benth. ARROYO WILLOW.** Shrub or tree 10 to 18 or rarely 35 feet high, the trunk 3 to 7 inches in diameter with smooth bark or very old trunks shallowly scamed; mature leaves oblong, obovate or linear, acute, obscurely serrulate, dull green and glabrous above, white-pubescent or pale beneath,  $1\frac{1}{2}$  to 5 inches long,  $\frac{1}{3}$  to  $1\frac{1}{4}$  inches broad; petioles 1 to 8 lines long; catkins appearing before the leaves, sessile, densely silky tomentose in the bud, suberect; scales dark; staminate catkins  $\frac{3}{4}$  to  $1\frac{1}{2}$  inches long, 5 to 6 lines thick; stamens 2. filaments glabrous, distinct or united to the middle; pistillate catkins  $\frac{3}{4}$  to 1 inch long, 3 to 4 lines thick, in fruit  $1\frac{1}{2}$  to  $2\frac{1}{4}$  inches long; capsule glabrous or puberulent, short-pediceled.

Coast Ranges, Sacramento and San Joaquin valleys and Sierra Nevada foothills, northward to the Klamath River and southward to Southern and Lower California. The most common willow in the foothill country throughout the State, especially along summer-dry arroyos but also found on living streams. Also called White Willow.

Var. ***bigelovii* Bebb.** Leaves broadly obovate or cuneate-oblong, obtuse,



entire,  $\frac{3}{4}$  to  $1\frac{3}{8}$  inches broad; catkins on short leafy peduncles.—San Francisco, where first collected by Bigelow, and elsewhere in the Bay region.

Refs.—*SALIX LASIOLEPIS* Benth. Pl. Hartw. p. 335 (1857), type loc. Salinas and Carmel rivers, *Hartweg*; Jepson, Fl. W. Mid. Cal. p. 137 (1901). Var. *BIGELOWII* Bebb in Bot. Cal. vol. 2, p. 86 (1880); *S. bigelowii* Torrey, Pac. R. Rep. vol. 4, p. 139 (1857). *S. franciscana* Seeman, Bull. Torr. Bot. Club, vol. 30, p. 634 (1903), the type from "Cliff House, San Francisco." *S. bakeri* Seeman, l. c. p. 635, type from "foothills near Stanford University."

7. *S. cordata* Muhl. var. *mackenziana* Hook. MACKENZIE WILLOW. Shrub; leaves oblong-lanceolate, narrowed to the subcordate or truncate base and tapering into the pointed apex, entire or serrulate, glabrous, light green above, often glaucous beneath, 1 to  $2\frac{1}{2}$  (or 4) inches long,  $\frac{1}{2}$  to  $\frac{3}{4}$  (or  $1\frac{1}{2}$ ) inches broad; petioles 1 to 3 lines long; stipules orbicular, early deciduous or none; catkins subsessile or shortly peduncled, especially the pistillate, sparingly leafy-bracted, dense, 1 to  $1\frac{1}{2}$  inches long, 3 to 4 lines thick; scales narrow, dark or black, the lower part villous with long white hairs; stamens 2, filaments glabrous, elongated, free or more or less united; style long, stigmas short, bifid; fruiting catkins 1 to  $1\frac{3}{4}$  inches long; ovary and capsule glabrous; pedicel 1 line long.

High mountains: Sierra Nevada (Mariposa and Calaveras cos.); Lake Co. (acc. Bebb) and far northward. Apparently rare in California. Our form has shorter and less leafy peduncles than the type of the Rocky Mts.

Var. *watsoni* Bebb. Branches smooth, polished, yellow; leaves dark green, smaller, oblong, short-acuminate, serrulate or subentire, 1 to 3 inches long; stipules small or none; catkins 1 inch long, crowded.—High montane, 6,000 to 9,000 feet; San Jacinto Mt., northern Sierra Nevada and eastward to Utah.

Refs.—*SALIX CORDATA* Muhlenberg in Ges. Naturf. Fr. Neue Schr. vol. 4, p. 236 (1803), Var. MACKENZIANA Hooker, Fl. Bor. Am., vol. 2, p. 149 (1853). Var. WATSONII Bebb in Bot. Cal. vol. 2, p. 86 (1880); Jones, Willow Fam. Great Plateau, p. 13 (1908).

8. *S. flavescens* Nutt. NUTTALL WILLOW. Shrub 2 to 15 feet high or a small tree 25 feet high; branchlets with whitish or very dark bark; leaves broadly obovate or oblong-obovate, entire, rounded at apex or shortly acute, 1 to  $1\frac{1}{2}$  (or 4) inches long,  $\frac{1}{2}$  to  $1\frac{1}{4}$  inches broad, yellow-green and lustrous above, yellow-veined, glabrate or densely short-silky beneath; petioles 4 lines long; catkins appearing before the leaves, oblong or elliptic,  $\frac{1}{2}$  to 1 inch long, 5 to 7 lines thick, sessile; scales obovate, rounded at apex, black or black-tipped, covered with white hairs; stamens 2, conspicuously long-exserted, filaments glabrous; ovary white-silky; style none, stigmas broadly linear, sometimes notched at apex; capsule less silky than the ovary.

Sierra Nevada, 4,000 to 10,000 feet, and seaward Coast Ranges, southward to the San Bernardino Mts., northward to the Siskiyou (W.L.J. no. 2947), and far north to British Columbia and throughout the Rocky Mts. in the United States. Highly variable in both Coast Ranges and Sierra Nevada. The form found at Monterey (*S. brachystachys* Benth.) is matched by a like form in the Sierra Nevada. Type loc. Rocky Mts. lat.  $39^{\circ}$ , Thos. Nuttall (Wyeth Exped.).

Refs.—*SALIX FLAVESCENS* Nuttall, Sylva, vol. 1, p. 65 (1842), not of Host; Bebb in Bot. Cal. vol. 2, p. 86 (1880), in part. *S. nuttallii* Sargent, Gard. & For. vol. 8, p. 463 (1895). Var. *brachystachys* Sargent, Silva N. Am. vol. 9, p. 142 (1896); Jepson, Fl. W. Mid. Cal. p. 137 (1901).

9. *S. macrocarpa* Nutt. var. *argentea* Bebb. SILVER WILLOW. Slender shrub 6 to 16 feet high with numerous stems from the base and very slender

pruinose branchlets; leaves lanceolate, acute at base, acuminate at apex, 1 to  $1\frac{1}{2}$  inches long, 2 to 5 lines wide, becoming green above, appressed silky beneath and imparting a silvery sheen, or glabrate and pale; petioles 1 to 3 lines long; catkins short-peduncled with 2 or 3 leafy bracts, the staminate 4 to 6 lines long and 3 lines thick, the pistillate 3 to 4 lines long and  $1\frac{1}{2}$  to 2 lines thick; scales dark or yellowish, rounded; filaments glabrous; style none or very short; ovary hoary; stigmas ovate, entire or emarginate; fruiting catkins  $\frac{1}{2}$  to  $\frac{3}{4}$  inch long, about as thick; capsules 2 to 3 lines long, light brown, puberulent, pediceled.

Sierra Nevada, 7,000 to 9,000 feet: Volcano Creek, common in and about the meadows in the Mt. Whitney region, W.L.J. no. 952; Mono Co., Congdon, and northward to Oregon and Idaho. The specific name, *macrocarpa*, is misleading since the capsules are not large.

Refs.—*SALIX MACROCARPA* Nuttall, *Sylva*, vol. 1, p. 83 (1842), type loc. banks of Columbia River, Nuttall; Bebb in *Bot. Gaz.* vol. 10, p. 221 (1885). Var. *ARGENTEA* Bebb, l. c. p. 223 (the types from Sierra and Plumas cos.), and in *Bot. Death Val. Exped.* p. 199 (1893). *S. geyeriana* Andersson, *Oefvers. Vet. Akad. Foerhandl.* vol. 15, p. 122 (1858); Bebb in *Bot. Cal.* vol. 2, p. 87 (1880). *S. covillei* Eastwood in *Zoe*, vol. 5, p. 80 (1900), type from Bubbs Creek, South Fork Kings River (not seen by us); the author of this proposition makes the statement that "it is so unlike that species [*S. macrocarpa argentea*] that it would be a waste of time to enumerate the differences."

10. ***S. sitchensis*** Sanson. SITKA WILLOW. Arborescent or shrubby. 5 to 25 feet high, the trunk 2 to 10 inches in diameter; leaves obovate to oblanceolate, rounded or shortly acute at apex, entire (obscurely serrulate on vigorous shoots), dark green and almost glabrous above, densely tomentose and lustrous silky beneath, 2 to 5 inches long, 1 to 3 inches broad; petioles 1 to 6 lines long; stipules small, early deciduous or on sterile shoots broad or orbicular, 4 to 6 lines long; staminate catkins  $1\frac{1}{4}$  to 2 inches long, 5 to 6 lines thick; stamens 1, or exceptionally 2 and their filaments more or less united; pistillate catkins  $\frac{3}{4}$  to 2 inches long and 3 lines thick, or in fruit 3 to 5 inches long; scales covered with long white silky hairs, the staminate rounded at apex, the pistillate shorter, broader and more acute; style elongated, stigmas short-oblong, entire or nearly so.

Immediate coast region from Santa Barbara to Marin and Humboldt cos., far north to Alaska (type loc. Sitka) and east to Blue Mts. of Oregon. Also called Silky Willow.

Forma *coulteri* Jepson, n. comb. (*S. coulteri* And.). Leaves coriaceous, densely woolly beneath, 2 to 3 inches long; stipules 3 or 4 lines long.—San Francisco, Bolander, no. 2451 and southward.

Forma *ralphiana* Jepson n. form. Leaves narrowly oblong, white beneath with a fine dense felt, 2 to  $3\frac{1}{2}$  inches long, 6 to 10 lines wide; stipules small; catkins about 2 inches long.—(*Folia anguste oblonga, subtus alba, coacta tenui densaque prædita, 2 ad 3½ poll. longa, 6 ad 10 lin. lata; stipulæ parvæ; amenta circa 2 poll. longa*).—Marble Fork of the Kaweah, 6,900 feet, W.L.J. no. 690. Named for Ralph Hopping, naturalist on the Kaweah North Fork.

Forma *parvifolia* Jepson n. form. Leaves oblanceolate, acute,  $\frac{3}{4}$  to  $1\frac{1}{4}$  inches long, 3 to 4 lines wide; stipules minute.—(*Folia oblanceolata, acuta, ¾ ad 1¼ poll. longa. 3 ad 4 lin. lata; stipulæ minutæ*).—Melbourne to Comptche, Mendocino Co., W.L.J. no. 2229.

Var. *angustifolia* Bebb. Leaves narrowly oblanceolate, acute or acuminate,

1 to 2 inches long, 3 to 4 lines wide, the margin revolute; stipules none; fruiting catkin 1 inch long.—Donner Pass, according to Bot. Cal., vol. 2, p. 87.

Refs.—*SALIX SITCHENSIS* Sanson in Bongard, Veg. Sitch. p. 162 (1831); Jepson, Fl. W. Mid. Cal. p. 137 (1901). Var. *ANGUSTIFOLIA* Bebb in Bot. Cal. vol. 2, p. 87 (1880). *S. coulteri* Andersson in Oefvers. Vet. Akad. Foerhandl, vol. 15, p. 119 (1858); Bebb in Bot. Cal. vol. 2, p. 90 (1880).

11. *S. lemmoni* Bebb. LEMMON'S WILLOW. Shrub 5 to 13 feet high; leaves lanceolate, acuminate at both ends, entire, green, nearly alike on both faces, glabrous or nearly so, dark-veined, 1 to 1½ inches long, 3 lines broad; petioles 1 or 2 lines long; stipules small, soon deciduous; catkins ½ inch long on very short peduncles with 2 or 3 foliaceous bracts; scales pitch-black, usually rounded, villous; stamens 2, filaments slightly puberulent at base; style short, stigmas short-linear, entire; ovary and capsule grayish tomentose or the latter glabrate; pedicels in fruit ½ to ¾ line long.

Sierra Nevada, 7,000 to 8,000 feet altitude from Mariposa Co., Congdon, northward to Plumas Co., and Washoe Co., Nevada; Wasatch Mts., Utah; eastern Oregon. First collected by J. G. Lemmon, a pioneer Californian botanist, in Sierra Co. The staminate flowers exceptionally bear 4 stamens, the filaments partly united in pairs, or 1 pair distinct.

Refs.—*SALIX LEMMONI* Bebb in Bot. Cal. vol. 2, p. 88 (1880), Bot. Gaz. vol. 16, p. 106 (1891); Jones, Willow Fam. Great Plateau, p. 16 (1908). *S. austinae* Bebb in Bot. Cal. vol. 2, p. 88 (1880), Bot. Gaz. vol. 16, p. 106 (1891); this name was founded on a mixture of material representing *S. lemmoni* and one or two other species.

12. *S. breweri* Bebb. BREWER WILLOW. Shrub; young leaves oblong, shortly acute, entire, white-pilose above but soon becoming green except along the midrib, white below with a close tomentum, ⅝ to 1 inch long, 2 to 3 lines wide; mature leaves green and puberulent above, rugose beneath and whitened with a thin but dense felt-like covering, entire, 2 to 2½ inches long, 3 to 4 lines wide; petioles almost none; stipules of sterile shoots small, ovate, acute; catkins appearing before the leaves, dense, ¾ inch long, 3 to 4 lines thick, sessile, with 2 or 3 small bracts at base; scales yellow, rounded at apex, rather densely pilose on both sides; stamens 2; filaments glabrous; nectary filiform, very long; ovary and capsule hoary; style elongated, stigmas 2-cleft.

San Carlos Range: Mt. San Carlos, W. H. Brewer, no. 788, July 23, 1861, 3,500 feet altitude (type loc.); headwaters of San Benito River, low crouching shrub along water's edge, W. L. Jepson, no. 2709, May 12, 1907, 4,000 feet altitude. Not otherwise known.

Ref.—*SALIX BREWERI* Bebb in Bot. Cal. vol. 2, p. 88 (1880).

13. *S. glauca* L. var. *villosa* And. Shrub 2 to 4 feet high; leaves oblong-lanceolate, acute or taper-pointed, entire, green above, slightly glaucous beneath, pubescent or subglabrous, when young villous tomentose, 1 to 2½ inches long, 3 to 7 lines wide; petioles almost none to 3 lines long; stipules lanceolate or none; catkins ½ to ¾ inch long, on leafy-bracteate peduncles, the staminate peduncles very short or almost none; scales hairy, dark, turning reddish; stigmas entire or 2-lobed; fruiting catkins ¾ to 1½ inches long; ovary hoary or tomentulose; capsule brown, finely pubescent, 3 to 4 lines long.

Sierra Nevada, 8,000 to 11,000 feet altitude: Farewell Gap, W.L.J. no. 1150; Bullfrog Lake, South Fork Kings, W.L.J. no. 851; San Joaquin, South Fork, Hall & Chandler; Chilnualna Trail, Mariposa Co., J. W. Congdon, northward and far northward.

Refs.—*SALIX GLAUCA* Linnæus, Sp. Pl. 1019 (1853). *S. villosa* Don in Hooker, Fl. Bor.

Am. vol. 2, p. 144 (1853), the type being from the northern Rocky Mts., coll. by Drummond. Var. *VILLOSA* Andersson, Sal. Bor. Am. p. 22 (1858). *S. glaucops* Andersson in DeCandolle, Prodr. vol. 16, pt. 2, p. 281 (1868).

14. **S. californica** Bebb. SIERRA WILLOW. Shrub 2 to 5 feet high, closely related to the preceding; leaves mostly oblong, acute at apex obtuse at base, appressed-villous and gray (or the young parts densely white tomentose), often glabrescent and green, finely glandular serrate,  $\frac{3}{4}$  to 2 inches long, 5 to 9 lines broad; margin of small leaves at base of both leafy and flowering shoots thickly studded with glands; stipules ovate, lanceolate or none; catkins on short leafy peduncles, the staminate  $\frac{1}{2}$  inch, the pistillate  $\frac{1}{2}$  to 1 inch long (in fruit 1 to  $1\frac{1}{2}$  inches long); scales dark, villous; ovary hoary-tomentose; style elongated, stigmas oblong, bifid or entire; capsule brown, finely pubescent, 2 to 3 lines long.

Sierra Nevada, 7,000 to 9,000 feet: House Meadows on North Fork Kings River; Mt. Goddard; Crescent Lake, Mariposa Co.; Yosemite National Park; Soda Springs of the Tuolumne; Summit, Placer Co.; near Mt. Lola, Nevada Co. No more than a subspecies or variety of the preceding it is distinguishable only by its glandular-serrate leaves which are, however, sometimes entire on the same branch.

Ref.—*SALIX CALIFORNICA* Bebb in Bot. Cal. vol. 2, p. 89 (1880).

15. **S. barclayi** And. BARCLAY WILLOW. Dwarf shrub; leaves white-tomentose when young, soon green, dark-veined, narrowly obovate, obtuse or bluntly acute, tapering to the shortly petioled base, entire or sometimes serrulate,  $\frac{1}{2}$  to  $1\frac{1}{2}$  inches long; catkins on short leafy peduncles, dense,  $\frac{3}{4}$  to  $1\frac{1}{2}$  inches long, 4 to 5 lines broad, the scales very black and covered with long white pilose hairs; stamens 2, filaments sometimes united  $\frac{1}{3}$  their length; ovary and capsule glabrous or nearly so, green, pediceled; style long, stigmas 2-lobed.

Subalpine: Marble Mt., Siskiyou Co., 6,000 feet; Warner Mts., Modoc Co.; northward into Oregon and far northward.

Refs.—*SALIX BARCLAYI* Andersson, in Oefvers. Vet. Akad. Foerhandl. vol. 15, p. 125 (1858); Bebb in Bot. Death Val. Exped. p. 198 (1893); Jones, Willow Fam. Great Plateau, p. 16 (1908).

16. **S. monica** Bebb. MONO WILLOW. Procumbent or erect branching shrub, 1 to 2 feet high; branchlets dark red; leaves ovate, acute at apex, acutish at base, ostensibly entire but obscurely and remotely serrulate, bright green above, somewhat pale below, glabrous or nearly so,  $\frac{1}{3}$  to  $1\frac{1}{2}$  inches long, 3 to 7 lines broad, rather conspicuously feather veined, the veins dark or black; petioles 1 to 3 lines long; stipules none; scales roundish ovate, hairy; catkins small and short, densely flowered, sessile or subsessile; bracts none or few and small; fruiting catkins  $\frac{3}{4}$  inch long; style medium sized, stigma usually entire; capsule brown, glabrate, sessile or subsessile, 2 lines long.

Sierra Nevada, local in the Tuolumne Meadows region, 9,000 to 11,000 feet altitude: Mono Pass, Mono Co., W. H. Brewer, no. 1732 (1863), J. W. Congdon (1894); Soda Springs of the Tuolumne, J. W. Congdon (1898); Yosemite National Park, Katherine Jones (1907). Obscure and little known species, possibly referable to some northern type.

Refs.—*SALIX MONICA* Bebb in Bot. Cal. vol. 2, p. 90 (1880), Bot. Gaz. vol. 16, p. 107 (1891).

17. **S. tenera** And. ALPINE WILLOW. Stems with very short often tortuous branches forming a depressed or prostrate plant body 1 to 4 inches high; flowering shoots 1 to 6 inches high; leaves oblong and acute, ovate-lanceolate,

entire, scantily pilose,  $\frac{1}{4}$  to 1 or  $1\frac{1}{2}$  inches long, 2 to 5 lines broad; catkins on erect leafy peduncles, densely flowered,  $\frac{1}{3}$  to  $\frac{3}{4}$  inch long, the pistillate 1 to 2 inches long; peduncles in fruit 1 to 2 inches long; style long, stigmas 2-cleft; capsules white woolly or glabrescent and brown, subsessile, 2 to 3 lines long.

Sierra Nevada, 9,000 to 11,000 feet: Mt. Whitney (southernmost locality), Mt. Brewer, Mt. Goddard, Mt. Lyell, Mt. Dana, and other high peaks and far northward to the Arctic Circle.

Refs.—*SALIX TENERA* Andersson in DeCandolle, *Prodromus*, vol. 16, pt. 2, p. 288 (1868), the type from the Cascade Mts., lat.  $49^{\circ}$ , 7,000 feet, *Lyall*. *S. arctica* Pallas var. *petraea* And. l. c. p. 287. *S. petrophila* Rydberg, *Bull. N. Y. Bot. Gard.* vol. 1, p. 268 (1899).

## 2. *POPULUS* L. POPLAR.

Trees with scaly buds and caducous stipules. Leaves rather long-petioled, broad. Winter buds covered by many scales. Catkins appearing before the leaves, in ours pendulous; scales imbricate or lacerate, falling as soon as released by the flowering elongation of the catkin. Stamens inserted on the surface of a concave disk. Ovary seated on a collar-like disk; style short; stigmas 2 to 4, narrow and elongated, or conspicuously dilated. Capsule 2 to 4-valved. Coma of the small seeds long and conspicuous.—North temperate zone, 18 species. (Classical Latin name of the Poplar.)

Stamens 40 to 80.

Leaves deltoid-orbicular, broader than long, yellowish green, alike on both faces; valley streams .....1. *P. fremontii*.

Leaves longer than broad, ovate, dark green above, rusty or silvery beneath; valley and mountain streams .....2. *P. trichocarpa*.

Stamens 6 to 12; leaves round-ovate, 1 to 2 inches long; high mountains...3. *P. tremuloides*.

1. *P. fremontii* Wats. COMMON COTTONWOOD. Handsome tree commonly 40 to 90 feet high with massive crown, the trunk 1 to 5 feet in diameter; bark white or whitish, on the main trunk 1 to 5 inches thick, roughly cracked; leaves triangular or roundish in outline, 2 to 4 inches broad, broader than long, the margin crenate except at the abruptly short-pointed apex and the truncate or subcordate base; scales regularly laciniate-fringed, shorter than the flowers; staminate catkins 2 to 4 inches long, densely flowered, each flower with 48 to 72 stamens; pistillate catkins 2 inches long (becoming twice as long in fruit), loosely flowered; ovary sinuously and strongly ridged about its middle and surmounted by 3 or 4 roundish stigmas; mature pods ovate, roughish on the surface, 4 to 5 lines long, borne on pedicels 2 lines long, opening by 3 or 4 valves; seeds copiously provided with long white hairs which soon involve the catkin in a soft cottony mass.

Valleys and foothills, usually along living streams: common in the Sacramento Valley from near Redding southward through the San Joaquin Valley, lower Sierra Nevada foothills and South Coast Ranges to Southern California and Mexico and far eastward to southern Colorado. Shunning the Redwood Belt and very rare in the North Coast Ranges where thus far noted only at the following localities: near Round Valley; fork of Eel River in northern Lake Co.; Russian River from Cloverdale to Ukiah. Not seen in Napa Valley nor in the valley of San Francisco Bay from San Rafael and San Pablo to Decoto. Most abundant and of greatest size on the Kaweah Delta. Valuable shade and roadside tree in hot interior valleys. Also called Fremont Cottonwood.

Refs.—*POPULUS FREMONTII* Watson, *Proc. Am. Acad.* vol. 10, p. 350 (1875), type loc. Deer



Creek, Tehama Co., *Fremont*; Havard, Gard. & For. vol. 3, p. 620 (1890); Merriam, N. Am. Fauna, no. 7, p. 335 (1893); Jepson, Fl. W. Mid. Cal. p. 138 (1901).

2. **P. trichocarpa** T. & G. BLACK COTTONWOOD. Tree commonly 30 to 125 feet high, with a broad head of upright branches; trunk 1 to 3 feet in diameter; bark light or dark in color but usually with a yellowish cast, longitudinally fissured, the long, narrow and rather smooth-surfaced plates separated by cleanly channeled fissures; leaves broadly or narrowly ovate, finely serrate, truncate or heart-shaped at base, acute or tapering to a point at apex,  $2\frac{1}{2}$  to 7 (or 11) inches long, lustrous green above, rusty-brown beneath when young but at length whitish; staminate catkins 1 to 2 or eventually 5 inches long, each flower with 40 to 60 stamens on a slightly one-sided disk; anthers light purple; pistillate catkins loosely flowered,  $2\frac{1}{2}$  to 3 inches long and 4 to 10 inches long in fruit; ovary crowned by 3 dilated and deeply lobed stigmas; pod nearly sessile, 3-valved; seeds with long lustrous white hairs.

Living streams in cañons and valleys: Sierra Nevada, 3,000 to 8,000 feet, common along streams and on such cañon floors as Kern, Kings and Yosemite; South Coast Ranges in the Mt. Diablo, Mt. Hamilton, Santa Cruz and Santa Lucia ranges and southward to the San Bernardino and San Jacinto mts., the most southerly locality on Palomar at Cootea (San Diego Co.); North Coast Ranges from northern Lake Co. westerly to Long Valley and Petrolia, and northward to Trinity Summit, Salmon, Shasta and Klamath rivers; far northward to Alaska. Most abundant on the Oregon and Washington coasts where it is lumbered for staves and woodenware. It is the tallest species in the genus. Winter buds covered with a balsam resin wherefore also called "Balm" and "Balsam Cottonwood."

Var. **cupulata** Wats. Disk campanulate, pubescent, twice longer than ovary. —Plumas Co., according to Bot. Cal., vol. 2, p. 91.

Forma **ingrata** Jepson n. form. Leaves lanceolate, 2 to  $4\frac{1}{2}$  inches long, 4 to 10 lines broad.—(Folia varia valde, lanceolata in typo, 2 ad  $4\frac{1}{2}$  poll. longa, 4 ad 10 lin. lata).—San Bernardino Mts., upper Santa Ana Cañon, mouth of north fork, H. M. Hall, no. 7517. A singular type but connected with the usual form by several transition states.

Refs.—*POPULUS TRICHOCARPA* T. & G. in Hooker, Icon. vol. 9, pl. 878 (1852), type loc. Santa Clara River, Ventura Co., C. C. Parry; Jepson, Fl. W. Mid. Cal. p. 138 (1901).

3. **P. tremuloides** Michx. ASPEN. Slender tree with branches gracefully pendulous towards the ends, 10 to 60 feet high, the trunk 3 to 10 inches in diameter, bark smooth, greenish white, or on old trunks nearly black; leaves round-ovate, finely toothed or almost entire, abruptly tipped at apex with a short sharp point, 1 to 2 inches long; staminate catkins  $1\frac{1}{2}$  to  $2\frac{1}{2}$  inches long, each flower with 6 to 12 stamens; pistillate catkins 2 to 4 inches long; ovary conical; stigmas 2, very thick below, divided above into 2 slender spreading lobes; style short and thick; seeds minute, brownish, bearing long white hairs.

Sierra Nevada, margins of streams or swampy meadows or on rocky drifts, 5,000 to 10,000 feet: Kern Cañon; Mineral King; Giant Forest; Bubbs Creek; North Fork Kings River; South Fork San Joaquin; Yosemite National Park and frequent northward to Donner and Modoc Co. Not known on Mt. Shasta and locally noted elsewhere in the State only in the Trinity Mts. (Cañon Creek) and San Bernardino Mts. (Fish Creek Cañon, San Gorgonio Peak, Jos. Grinnell, the leaves less than 1 inch long and broader than long). Ranges



east to the Rocky Mts., south to Mexico, north to Alaska, across the continent to Labrador, thence south to Tennessee. It has a more extensive distribution than any other North American tree. Occurs only in small scattered thickets in California but forming extensive pure forests in the Rocky Mts. Wood burns green.

Refs.—*POPULUS TREMULOIDES* Michaux, Fl. Bor. Am. vol. 2, p. 243 (1803); Sudworth, 21st Rep. U. S. Geol. Sur. pt. 5 (For. Res.), pp. 517, 542 (1900).

## BETULACEAE. BIRCH FAMILY.

Wind-pollinated trees or shrubs with alternate simple petioled leaves and caducous stipules. Flowers small, borne in catkins. Staminate catkins elongated, pendulous, falling after flowering, the flowers in clusters of 3 in the axil of each bract, consisting of a membranous commonly 4-parted calyx and 1 to 7 (commonly 2 or 4) stamens; bracts dilated above with the apex abruptly upturned, each covering 4 bractlets. Pistillate catkins small, erect, spike-like, the flowers 2 in the axil of each bract, without perianth, consisting of a pistil with 2 styles and a 2-celled ovary with 1 ovule in each cell. Fruit a very small compressed 1-seeded nutlet which is margined or winged.—Two genera.

Bibliog.—Parry, C. C., Pacific Coast Alders (Bull. Cal. Acad., vol. 2, p. 351,—1887). Winkler, H., Betulaceae (Das Pflanzenreich, bd. 4, lief. 61,—1904).

Pistillate catkins in clusters, forming in fruit oval or ovoid woody cones which are drooping or spreading, their scales obscurely 5-lobed at apex; stamens 1 to 7.....1. *ALNUS*. Pistillate catkins solitary, cylindrical and erect in fruit, falling to pieces when mature, their scales plainly 3-lobed at apex; stamens 2.....2. *BETULA*.

### 1. *ALNUS* L. ALDER.

Peduncles branched or forked, bearing a cluster of few to several catkins. Calyx of staminate flower 4 (or 6)-parted; stamens 1 to 7. Pistillate catkins in clusters of 2 to 4, forming woody pendulous cones when mature, the bracts and bractlets united into 5-lobed scales which are persistent on the axis. Nutlet with a narrow acute margin.—North temperate regions, a few ranging in the high mountains to Bolivia; about 18 species, 9 in North America. (*Alnus*, the ancient Latin name.)

Catkins appearing in the early autumn as rather conspicuous naked buds, and flowering in the late winter or early spring before the leaves appear; peduncles of the pistillate catkins naked, their branches  $\frac{1}{2}$  inch long or less; sepals 4; stamens 1 to 4.

Trees 30 to 80 feet high; mostly of low altitudes.

Leaf-margin plane, with small scattered teeth; bracts of staminate catkin obtuse; stamens 1 to 3, rarely 4.....1. *A. rhombifolia*.

Leaf-margin with narrowly revolute edge, rather coarsely toothed; bracts of staminate catkins acute or acutish; stamens 4, rarely 3.....2. *A. rubra*.

Shrubs 8 to 15 feet high; leaf-margin coarsely toothed and again finely toothed; stamens 4 or 2; high montane.....3. *A. tenuifolia*.

Catkins appearing in the spring from scaly buds at the same time as the leaves; peduncles of the pistillate catkins leafy (at least at base), their branches  $\frac{1}{2}$  to 1 inch long; sepals 6; stamens 6 or 7; leaf-margin sharply or lacinately toothed; high montane shrub.....4. *A. viridis*.

1. *A. rhombifolia* Nutt. WHITE ALDER. (Fig. 61.) Tree commonly 30 to 80 feet high with whitish or gray-brown bark; trunks  $\frac{1}{2}$  to  $3\frac{1}{2}$  feet in diameter; leaves 2 to 4 inches long, minutely pubescent, elliptic and obtuse, or more commonly oblong-ovate or oblong-rhombic and tapering more or less to the apex, at base broadly wedge-shaped and entire, the remainder of the margin provided with small and more or less unequal glandular teeth; staminate catkins in

clusters of 2 to 7, slender, 2 to 3 (or 5) inches long; sepals 2 to 4, most commonly 3, often unequal, one usually very small when the number is 4; stamens 2, less commonly 3; pistillate catkins 3 to 7 in a cluster, erect or ascending, 5 to 6 lines long, in fruit becoming ovoid and 5 to 9 lines long; nutlets flattened, 1 line broad.

Banks of rivers and perennial streams: Sierra Nevada cañons; Sacramento and San Joaquin valleys; Coast Ranges except in the narrow coast strip occupied by the Red Alder; cismontane Southern California as far south as the Cuyamaca Mts.; northward to the Cascades of Washington (eastern slope) and northern Idaho. Grows in the lower Sacramento country within a few feet of sea-level, thence practically continuous to 6,500 feet and 8,000 feet in the southern Sierra Nevada, a remarkable altitudinal range.

Refs.—*ALNUS RHOMBIFOLIA* Nuttall, *Sylva*, vol. 1, p. 33 (1842), type loc. vicinity of Monterey, Nuttall; Watson in Bot. Cal. vol. 2, p. 80 (1880), in part; Jepson, Fl. W. Mid. Cal. p. 139 (1901). *A. oblongifolia* Watson in Bot. Cal. vol. 2, p. 80 (1880) in part.

2. **A. rubra** Bong. RED ALDER. Tree commonly 30 to 90 feet high, usually with very white or white-mottled bark; trunk unbranched for 15 to 60 feet, 1 to 2½ feet in diameter; leaves 2 to 6 inches long, elliptic-ovate, often rusty beneath, with coarse teeth which are again finely toothed, the entire margin with a narrow underturned edge; staminate catkins stoutish, 3 to 7 inches long; calyx with 4 stamens, but sometimes with 3, especially at upper end of catkin; pistillate catkins 4 to 6 lines long, maturing into oblong-ovoid cones ¾ to 1½ inches long; nutlets flattened, acutely margined or some narrowly winged, roundish, 1 to 1½ lines broad.

Deep cool cañons or moist flats from the Santa Inez Mts. north to the Santa Cruz Mts., Oakland Hills, Point Reyes Peninsula, and so on along the coast far north to southern Alaska. With us most abundant in Marin, Mendocino and Humboldt cos., where it forms pure groves of singular beauty in marshy bottoms near the sea. Wood used for fish-barrels, bungs for oak-barrels, buggy-boxes, brake-blocks and in cabinet work.

Refs.—*ALNUS RUBRA* Bongard, *Veg. Sitka*, p. 162 (1833), the type coll. by R. H. Mertens at Sitka. *A. oregona* Nuttall, *Sylva*, vol. 1, p. 28, pl. 9 (1842); Jepson, Fl. W. Mid. Cal. p. 139 (1901).

3. **A. tenuifolia** Nutt. MOUNTAIN ALDER. Small tree or shrub 8 to 14 feet high; leaves roundish to ovate, thickish, at base truncately rounded (or even subcordate) to cuneate, coarsely toothed and again finely serrate, 1 to 3 inches long; staminate catkins 3 or 4 in a cluster, 3 inches long; stamens 2 to 4, not exceeding the 4 sepals; pistillate catkins 3 to 8 in a cluster, sessile or with peduncles almost 2 lines long; cones small, 3 to 7 lines long.

Sierra Nevada from Donner Pass northward to Mt. Shasta, thence westward to Trinity Summit (W.L.J. no. 2058) and the Siskiyou, forming thickets on wet hillsides or in moist hollows at 5,000 to 7,000 feet. Ranges north to the Yukon Territory, thence south through the Rocky Mts. to New Mexico. Also in Lower California.

Refs.—*ALNUS TENUIFOLIA* Nuttall, *Sylva*, vol. 1, p. 32, t. 10 (1842), the original specimens from the Rocky Mts., and Blue Mts. of Oregon, Nuttall. *A. incana* var. *virescens* Watson in Bot. Cal. vol. 2, p. 81 (1880).

4. **A. viridis** DC. var. **sinuata** Regel. THIN-LEAF ALDER. Slender shrub 6 to 10 feet high; leaves round ovate, thin, gummy when young, bright green, sharply or laciniately toothed, 2¼ to 3 inches long; catkins appearing in spring at the same time as the leaves, the peduncles of the pistillate leafy at least at

base, their branches  $\frac{1}{2}$  to 1 inch long; staminate catkins yellowish green, a distinct purple spot on the ends of the bracts; sepals 6; stamens 6 or 7.

Subalpine in northern California, occurring on Trinity Summit (W.L.J. no. 2110) and Mt. Shasta, at about 6,500 to 7,000 feet, thence ranging far northward.

Refs.—*ALNUS VIRIDIS* DeCandolle, Fl. Fr. vol. 3, p. 304 (1805). Var. *SINUATA* Regel, Gatt. Bet. und Alnus, p. 422 (1865). *A. sinuata* Rydberg, Bull. Torr. Club, vol. 24, p. 190 (1897).

## 2. *BETULA* L. BIRCH.

Staminate catkins 1 to 3 in a cluster, sessile or short-peduncled; calyx 4 (or 2)-lobed; stamens 2, the filaments shortly forked at apex, each fork with an anther-cell. Pistillate catkins solitary on the peduncle and erect, each scale consisting of the bract and 2 bractlets united; scales falling away from the axis when the fruit is mature. Nutlet seed-like, with a broad thin wing.—Chiefly far northern regions (no other tree reaches so far north as the Canoe Birch which goes to  $66^{\circ}$  N. lat.); about 35 species.

Leaves 1 to 2 inches long; lobes of bracts broad, usually parallel, acutish...1. *B. occidentalis*. Leaves  $\frac{1}{2}$  to 1 inch long; lobes of bracts narrow, divergent, obtusish.....2. *B. glandulosa*.

1. *B. occidentalis* Hook. WATER BIRCH. Slender tree 10 to 25 feet high, with red-brown smooth bark and warty twigs; leaves round ovate, sharply serrate, mostly acute at apex, almost or quite glabrous and 1 to 2 inches long; petioles 4 or 5 lines long; staminate catkins 2 to  $2\frac{1}{2}$  inches long; pistillate catkins  $1\frac{1}{2}$  inches long in fruit and 3 or 4 lines in diameter; nutlets 1 to  $1\frac{1}{2}$  lines broad.

Sierra Nevada, east slope from near Walker Pass northward, common in the cañons west of Owens Lake (W.L.J. no. 905); noted on the west slope only on Bubbs Creek (W.L.J. no. 807) and near Simpson's Meadow. Siskiyou south to Grouse Creek, Humboldt Co., and north to British Columbia and east to Montana.

Forma *inopina* Jepson n. form. Tree 15 feet high; young branches rather densely hairy; pistillate catkins 1 inch long and 2 lines in diameter in fruit.—(Arbor 15 ped. alta, ramis juvenilibus subdense pilosis; amenta feminina 1 poll. longa et in fructo 2 lin. in diametro).—Forks of Salmon River to Cecilville, western Siskiyou, W.L.J. no. 2083, July 19, 1902.

Refs.—*BETULA OCCIDENTALIS* Hooker, Fl. Bor. Am. vol. 2, p. 155 (1853); Winkler, Engler's Pflanzenreich, vol. 4, pt. 61, p. 86 (1904). *B. fontanalis* Sargent, Bot. Gaz. vol. 31, p. 239 (1901). *B. alba*, forma *occidentalis* Fernald, Am. Jour. Sci. ser. 4, vol. 14, p. 173, t. 5, f. 3 (1902).

2. *B. glandulosa* Michx. SCRUB BIRCH. Shrub 1 to 4 feet high with glandular-warty twigs; leaves roundish, serrate,  $\frac{1}{2}$  to 1 inch long; pistillate catkins 4 to 9 lines long; nutlet 1 line broad.

High mountains of northern Sierra Nevada (Bridge Creek, Lassen Co.), Warner Range (Modoc Co.), and northward to subarctic regions where it covers vast tracts of country.

Ref.—*BETULA GLANDULOSA* Michaux, Fl. Bor. Am. vol. 2, p. 180 (1803), type loc. Lake Mistassinnis, Labrador.

## CORYLACEAE. HAZEL FAMILY.

Shrubs or bushes with alternate simple leaves. Staminate flowers in catkins without perianth; stamens 4 (seemingly 8) with forked filaments, each fork bearing one cell of an anther, the undivided portion of the filament cohering more or less with the scale or obsolete. Pistillate flowers several in a scaly bud,

2 to each bract; each flower with a very small laciniate-fringed posterior and anterior bractlet; perianth minute, adnate to the 2-celled ovary and without limb; style short; stigmas slender, elongated. Bractlets in fruit much enlarged and foliaceous, forming a tubular involucre enclosing the nut.—Four genera.

### 1. *CORYLUS* L. HAZEL.

Leaves broad, thin, serrulate or incised. Staminate catkins pendent, cylindrical, single or fasciated, from scaly lateral buds, the pistillate clusters of flowers terminal and lateral on the same branchlets. Flowers appearing before the leaves.—North Temperate Zone, 7 species. (Ancient Greek name.)

1. *C. rostrata* Ait. var. *californica* A. DC. CALIFORNIA HAZEL. Most commonly 6 to 10 feet high; leaves obovate to roundish, rounded at apex or shortly acute, sometimes obscurely 3-lobed above middle, glandular-pubescent or villous,  $1\frac{1}{2}$  to 4 inches long; anthers with a sparse tuft of hairs at apex; involucre densely hispid, prolonged beyond the nut into a laciniately fringed tube 1 inch long, or sometimes very short ( $\frac{1}{4}$  inch long); nut ovoid, bony, 6 lines long.

Along streams in cool cañons or on moist slopes: Coast Ranges from the Santa Cruz Mts., Oakland Hills, Marin Co. and Napa Co., northward to Mt. Shasta; Sierra Nevada, 2,500 to 5,000 feet, Marble Fork Kaweah (W.L.J. no. 686) northward. Not seen in Vaea Mts. nor in San Carlos or Santa Lucia ranges. The Eastern *C. rostrata* has long-pointed leaves. The Californian plant has leaves rounded at apex but does not differ in pubescence nor in tube of involucre which is often as long and narrow as in Eastern type. Two and three-year-old shoots furnish the Indian women with the twigs they most commonly employ for the ribs of baskets.

Refs.—*CORYLUS ROSTRATA* Aiton var. *CALIFORNICA* A. DeCandolle, Prodr. vol. 16, pt. 2, p. 133 (1864), type loc. woods near Santa Cruz, Hartweg; Jepson, Fl. W. Mid. Cal. p. 140 (1901). *C. californica* Heller, Bull. Torr. Club, vol. 25, p. 580 (1898).

### FAGACEAE. OAK FAMILY.

Trees or shrubs with alternate simple leaves and promptly deciduous stipules. Flowers monoecious, apetalous, appearing with the leaves in the deciduous kinds. Staminate flowers in catkins; calyx parted into several lobes; stamens 4 to 12. Pistillate flowers 1 to 3 in an involucre of imbricated scales, the involucre borne in reduced or short catkins; ovary adherent to the calyx, 3-celled, 6-ovuled, only one ovule maturing, the remaining ovules and the other two cells abortive. Fruit a nut borne singly in a scaly cup, or 1 to 3 in a spiny bur.—Eight genera; *Fagus* (Beech) and *Castanea* (Chestnut) are represented in the eastern United States as well as in the Old World.

Bibliog.—Engelmann, Geo., Papers on American Oaks (Collected Works, p. 399,—1887). Greene, E. L., West American Oaks (1889). Sargent, C. S., Silva N. Am. vol. 8 (1895), vol. 9 (1896).

Fruit an acorn; catkins simple.

Catkins unisexual, slender, the staminate drooping.....1. *QUERCUS*.

Catkins erect, thick, all with staminate flowers, pistillate flowers at base of some of them. ....2. *PASANIA*.

Fruit a spiny bur; catkins erect, often branching, the staminate long, the pistillate short. ....3. *CASTANOPSIS*.

### 1. *QUERCUS* L. OAK.

Trees or shrubs of slow growth, hard wood and usually contorted branches. Flowers greenish or yellowish. Staminate catkins pendulous, one or several

from the lowest axils of the season's shoot. Pistillate flowers borne in the upper axils of the season's shoot, the ovary with 3 to 5 styles or stigmas. Fruit an acorn, the nut set in a scaly cup. Abortive ovules often discernible in the ripe or nearly ripe acorn.—About 300 species distributed over the northern hemisphere. California has 14 species, 9 trees and 5 shrubs; it is for its area strong in species but very weak in individuals. Washington has 1 and Oregon 5 species, all of which occur in California. (Latin name of the oak.)

**White Oaks.**—Bark commonly white or whitish, wood light-colored; stamens mostly 6 to 9; stigmas sessile or nearly so; abortive ovules mostly towards base of nut.

Acorns maturing the first year; nut glabrous on the inner surface.

Deciduous species.

Branchlets pendulous; acorn cups deep, the nut long and slender; leaves pinnately parted with coarsely 2 to 3-toothed lobes; trunk bark dark brown, deeply cuboid checked; valleys .....1. *Q. lobata*.

Branchlets not pendulous; acorn cups shallow; trunk bark white, shallowly checked but smoothish.

Leaves dark lustrous green above, rusty or pale beneath, 5 to 7-parted; nut subglobose or oblong-cylindric.

Mossy trees; mainly North Coast Ranges.....2. *Q. garryana*.

Shrub; montane ..... *Var. breweri*.

Leaves bluish green above, pale beneath, oblong, coarsely toothed or entire; nut oval, often swollen at or below middle; dry foothills.3. *Q. douglasii*.

Evergreen species.

Small tree; leaves blue-green, oblong, mainly entire, nut subcylindric; southern California .....4. *Q. engelmannii*.

Shrubs; cups saucer-shaped.

Branches rigid; leaves  $\frac{3}{4}$  to 1 inch long; chaparral areas.

Leaves brittle, plane, light green, oblong, spiny-dentate or entire; nuts oval to cylindric, blunt or pointed .....5. *Q. dumosa*.

Leaves tougher, dark green, convex above, regularly dentate; nuts short cylindric or subglobose, very obtuse.....6. *Q. durata*.

Branches slender, pliable; leaves 3 to 4½ inches long, strongly parallel-nerved, toothed, chestnut-like; local in Siskiyou and vicinity.....7. *Q. sadleriana*.

Acorns maturing the second year; nut tomentose or hairy within.

Trees; acorn cup usually very large and thick.

Leaves 2 to 3½ inches long, densely woolly when young, with prominent regular parallel nerves; islands off south coast.....8. *Q. tomentella*.

Leaves commonly 1 to 2 inches long, entire or spinose-toothed, dull green above, lead-color beneath or with a golden fuzz when young; cup typically like a yellow turban; mountains .....9. *Q. chrysolepis*.

Shrubs; acorn cup sub-turbinate or low bowl-shaped, thin; leaves ½ to 1½ inches long.

Branches slender and pliable, forming broom-like tufts at top of stems; leaves mostly entire, no golden fuzz; high montane.....10. *Q. vaccinifolia*.

Branches rigid, spreading; leaves dentate-prickly, olivaceous above, pale beneath; Southern and Lower California.....11. *Q. palmeri*.

**Black Oaks.**—Bark dark or black, wood dark or reddish; stamens mostly 4 to 6; stigmas on long styles; abortive ovules mostly towards top of nut; nut tomentose within.

Acorns maturing the first year, nut slender ovate; leaves roundish or elliptic, convex above; coast valleys and hills.....12. *Q. agrifolia*.

Acorns maturing the second year.

Leaves oblong, obtuse or tapering to the acute apex, plane, pale yellowish below; nut slender ovate, often streaked longitudinally; interior valleys and hills.....13. *Q. wislizenii*.

Leaves pinnately parted, the divisions generally coarsely toothed, always bristle-tipped; nut oblong, obtuse; mountains.....14. *Q. kelloggii*.

1. *Q. lobata* Neé. VALLEY OAK. (Figs. 62 and 63.) Graceful tree, com-

monly 40 to 75 but not rarely 100 to 125 feet tall, with a great crown which, in typical form, is broader than high, and whose spreading limbs finally end in long and slender pendulous branchlets reaching nearly or quite to the ground; trunk 2 to 8 or even 10 feet in diameter and 10 to 30 feet in height; bark on the main trunks 1 to  $4\frac{1}{2}$  inches thick, dark brown or sometimes ashen gray, and checked nearly to the wood into plates 1 or 2 inches across. the plates on typical trunks cuboid but often rectangular or narrow; leaves 3 to 4 (rarely 6) inches long, 2 to 3 inches broad, green above, paler beneath with a thin but close covering of short hairs, yellow-veined, parted to the middle



FIG. 62. *QUERCUS LOBATA* Neé. *a*, Typical leaf; *b*, *c*, acorns. nat. size.

or nearly to the midrib into 3 to 5 pairs of lobes; lobes most commonly broadened towards the end, less frequently pointed, coarsely 2 or 3-toothed at apex or sometimes entire; staminate catkins 1 to 3 inches long; calyx-lobes 6 to 8, linear; stamens 8 to 11; pistillate flowers mostly solitary and sessile, producing acorns which mature in the first autumn; cup drab-brown, with a dull reddish tint, deeply hemispherical and very warty or tuberculate,  $\frac{1}{2}$  to  $\frac{3}{4}$  inch deep or more, and of greater diameter than the nut; nut long conical, at first bright green, later mahogany or chestnut-brown,  $1\frac{1}{2}$  to  $2\frac{1}{4}$  inches long,  $\frac{1}{2}$  to  $\frac{3}{4}$  inches in diameter.

Sacramento and San Joaquin valleys, and valleys of the Sierra Nevada foothills and Coast Ranges. Found as far north as Anderson and Shasta in Shasta Co., and Trinity River; as far south as Fort Tejon, and Ojai Valley, a few trees at San Fernando and Los Angeles. Characteristic of the richest valley loams where groves of scattered trees form park-like stretches of unequalled beauty. Sometimes occurring on low clay hills or in dry gravelly soil, especially in a less vigorous non-weeping form. Absent from valleys





FIG. 63. *QUERCUS LOBATA* Neé. Tree with the characteristic weeping sprays. Usually scattered about singly on the valley floors, rarely crowding each other. (West side of the Sacramento Valley, one mile east of Vacaville.)



facing the sea. Wood hard but brittle and used only for fuel. Called also Burr Oak, Weeping Oak, Roble, White Oak, Mush Oak, Swamp Oak, Bottom Oak and Water Oak.

Forma *argillora* Jepson n. form. Tree mostly or quite destitute of pendulous branchlets; bark smoother, often whitish and simulating Blue Oak bark; leaves usually very deeply and narrowly lobed, often persistent through the winter.—(Arbor ramulis pendulis nullis vel paucis; cortex levior, albineus; folia pinnatifida, profundis lobis angustis, per hiemen saepe persistentia).—Clay hills, as on the Araquipa Hills, Solano Co.



FIG. 64. *QUERCUS LOBATA* Néé VAR. *WALTERII* Jepson. *a*, Leaf; *b*, acorn. nat. size.

Forma *insperata* Jepson n. form. Leaves narrow,  $\frac{3}{4}$  to  $1\frac{1}{4}$  inches broad,  $1\frac{1}{2}$  to  $2\frac{1}{4}$  inches long; cups strongly tuberculate, not so deep as in type; nuts rather smaller,  $1\frac{1}{4}$  to  $1\frac{5}{8}$  inches long.—(Folia angusta, profunde pinnatifida,  $\frac{3}{4}$  to  $1\frac{1}{4}$  poll. lata,  $1\frac{1}{2}$  to  $2\frac{1}{4}$  poll. longa; cupulae tuberculatae, minoris altitudinis quam in typo; glandes paulo minores,  $1\frac{1}{4}$  ad  $1\frac{5}{8}$  poll. longae).—Kaweah River basin, 3,500 feet, Walter Fry, Nov. 1908.

Forma *rarita* Jepson, n. form. Dwarfish or shrub-like; leaves smaller, deeply lobed ( $1\frac{1}{2}$  to 2 inches long,  $\frac{3}{4}$  to  $1\frac{1}{2}$  inches broad).—Pygmæa vel fruticosa; folia minora, profunde lobata,  $1\frac{1}{2}$  ad 2 poll. longa,  $\frac{3}{4}$  ad  $1\frac{1}{2}$  poll. lata).—Near chaparral areas as on Twin Sisters Peak (W.L.J. no. 2384).

Var. *walterii* Jepson n. var. (Fig. 64.) Leaves 3 to 4 inches long, nearly as broad, sharply but mostly shallowly sinuate; cup large (1 inch broad) but

shallow; nuts thick ovate, obtuse,  $1\frac{1}{2}$  inches long, 1 to  $1\frac{1}{8}$  inches thick.—(Folia 3 ad 4 lin. longa, pæne eiusdem latitudinis, sinibus acutis sed plerumque brevibus; cupula magna, 1 poll. lata, sed brevis; glandes crassæ ovatæ obtusæ,  $1\frac{1}{2}$  poll. longæ, 1 ad  $1\frac{1}{8}$  poll. latæ).—Kaweah River basin, 4,600 feet altitude, Walter Fry.

Var. *turbinata* Jepson n. var. Tall trees with larger, mostly deeply lobed leaves and more open sinuses than in the type; nuts inversely top-shaped and set in shallow cups with scales not so strongly tuberculate.—(Arbor magna alta; folia maiora plerumque profunde lobata, sinibus amplioribus quam in typo; glans turbinata inversa forma; cupula brevis squamis minoribus tuberculatis).—Little Lake Valley, W.L.J. nos. 2403, 2404.

Refs.—*QUERCUS LOBATA* Neé, An. Cienc. Nat. vol. 3, p. 277 (1801), type from the Monterey region; Greene, *Erythea*, vol. 2, p. 64 (1894); Shinn, Gard. & For. vol. 10, p. 52, fig. 8 (1897); Purdy, Gard. & For. vol. 10, p. 202, figs. 25, 26 (1897); Jepson, *Erythea*, vol. 7, p. 131 (1899), Fl. W. Mid. Cal. p. 142 (1901). *Q. hindsii* Benth, Bot. Sulphur, p. 55 (1844), cited as from San Francisco where it does not grow; the label on type in the Kew Herbarium reads "San Francisco-Rio Sacramento," indicating clearly that it was collected on the lower Sacramento River expedition of the Sulphur by *Hinds*; Newberry, Pac. R. Rep. vol. 6, pt. 3, p. 29, pl. 1, fig. 7 (1857).

2. *Q. garryana* Dougl. OREGON OAK. Tree 25 to 55 feet high, the trunk  $1\frac{1}{2}$  to 5 feet in diameter and dividing into wide-spreading limbs which support a broad rounded crown 30 to 60 feet in diameter; trunk bark white, thin ( $\frac{1}{2}$  inch thick), smoothish, but on typical trunks superficially fissured into longitudinal bands which are transversely checked into small squarish scales 1 inch or less in diameter; leaves 3 to 4 or 6 inches long,  $1\frac{1}{2}$  to  $3\frac{1}{2}$  inches broad, dark lustrous green and subglabrous on the upper surface, rusty or pale, finely pubescent and yellow-veined beneath, leathery in texture and parted into 5 to 7, or rarely 9, lobes with mostly deep and often acute sinuses; lobes entire or with 2 or 3 coarse rounded unequal teeth; staminate catkins hirsute; stamens 4 to 6; pistillate flowers sessile or short-pedunculate; acorns maturing in first autumn; cup saucer-shaped, 6 to 9 lines broad, with tuberculate scales; nut bulging beyond the small cup, typically subglobose but varying to obovoid or subcylindric, although always rounded at apex,  $\frac{3}{4}$  to  $1\frac{1}{4}$  inches long,  $\frac{2}{3}$  to 1 inch thick, its surface polished and shining.

Coast Ranges: Santa Cruz Mts.; Mt. Tamalpais, north slope; mountain slopes on both sides of Santa Rosa, Russian River and Ukiah valleys; abundant on all the higher mountains from Ridgewood, Willits, Sherwood, Cummings, Bell's Springs and Round Valley north to Siskiyou Co., mostly from 1,500 to 4,000 feet. Associated with Douglas Fir, Madroña and Black Oak (cf. Fig. 8); not in main Redwood Belt. Far north to Washington and British Columbia where it is the only oak. Wood used for shipbuilding and interior finish in Oregon. Also called Post Oak and Garry Oak.

Var. *semota* Jepson n. var. Leaves pinnatifid, the sinuses rather sharp, 3 to 4 inches long,  $1\frac{3}{4}$  to  $2\frac{1}{4}$  inches broad; cup shallow, scale tips thin, only slightly or somewhat tuberculate at base; nuts oval, 10 to 13 lines long.—(Folia pinnatifida sinibus subincisis, 3 ad 4 poll. longa,  $1\frac{3}{4}$  ad  $2\frac{1}{4}$  poll. lata; cupula brevis, apicibus squamarum tenuibus, basi subtuberculatis; glans ovalis, 10 ad 13 lin. longa).—Southern Sierra Nevada from the Kaweah Basin (type loc. 5,000 feet) northward to Mariposa. Scarcely different save in size and heretofore referred by authors to *Q. breweri*.

Var. *breweri* Jepson, n. comb. (*Q. breweri* Engelm.) BREWER OAK. Spread-

ing shrub 4 to 18 feet high; leaves pinnately parted to middle, the lobes entire and acute, or broad and again lobed, finely pubescent or at length subglabrous, sometimes nearly felt-like below, often lustrous green above; cups shallow, 7 to 10 lines broad and 3 to 4 lines deep; the scales tuberculate; nuts oval,  $\frac{3}{4}$  to  $1\frac{3}{8}$  inches long and  $\frac{1}{2}$  to 1 inch broad.—High montane, Klamath Range (W.L.J. no. 2884), Marble Mt. (no. 2845), eastward to "six miles west of Mt. Shasta" (type loc. W. H. Brewer), south to the Trinity Mts. and perhaps the Yollo Bolly Range.

Refs.—*QUERCUS GARRYANA* Douglas in Hooker, Fl. Bor. Am. vol. 2, p. 159 (1853), type loc. Columbia River, *Douglas*; Jepson, Fl. W. Mid. Cal. p. 142 (1901). *Q. douglasii* Benth. Pl. Hartw. p. 337 (1857), not of Hook. & Arn. teste specimen in Kew. Hb. (W.L.J.). *Q. oerstediana* Greene, West Am. Oaks, p. 19, pl. 10 (1889). *Q. oerstediana* R. Br. Campst, Ann. & Mag. Nat. Hist. ser. 4, vol. 7, p. 250 (1871) doubtless belongs here; the type was collected in Cañon Creek, Siskiyou Mts., 2,500 to 4,000 feet; described as "being always a shrub." *Q. breweri* Engelmann in Bot. Cal. vol. 2, p. 96 (1880).

3. *Q. douglasii* H. & A. BLUE OAK. Tree commonly 20 to 60 feet high, typically with a rounded crown; trunk  $\frac{1}{2}$  to 2 (or sometimes 4) feet in diameter; bark white, shallowly checked into small thin plates, only slightly roughened but with the characteristic roughness extending up the limbs well onto the branches; leaves minutely pubescent, bluish green above, pale beneath, 1 to 3 inches long,  $\frac{1}{2}$  to  $2\frac{1}{2}$  inches broad, mostly oblong to obovate, entire, or coarsely and often unequally few-toothed, or shallowly lobed; staminate catkins about 1 inch long; calyx yellow or green, with laciniately cleft segments and about 9 stamens; acorns ripe in first autumn; cup 4 to 6 lines broad, of less diameter than the nut and very shallow, the scales with small wart-like processes; nut  $\frac{3}{4}$  to  $1\frac{1}{2}$  inches long, 6 to 10 lines in diameter, dark or light brown, oval in outline but variable, often much swollen just below or at the middle or only on one side, or again narrow and tapering to apex.

Dry or rocky foothills: Sierra Nevada between 500 and 2,500 feet; inner North Coast Ranges from the Vaca Mts. north to Redding and Trinity; Napa and Mt. Hood ranges north to Ukiah and Round Valley, but not in the high ranges from Willits north to the Siskiyou; inner South Coast Ranges from Mt. Diablo to Tehachapi, west to the San Antonio and Nacimiento river valleys (where very abundant) and south to the Sierra Liebre and San Fernando Valley (the southern outposts). Although constitutionally adapted to the arid foothills the stand is very open or scattered; it occurs by itself over long stretches of country or as an associate of the Digger Pine or Interior Live Oak. Also called Jack Oak, Post Oak, Rock Oak, Iron Oak, and Douglas Oak. Wood inferior, although some trees furnish good timber.

Refs.—*QUERCUS DOUGLASII* Hooker & Arnott, Bot. Beechey, p. 391 (1841), type loc. probably South Coast Ranges, first collected by Douglas; Hooker, Icon. vol. 4, t. 382, 383 (1841); Jepson, Fl. W. Mid. Cal. p. 142 (1901).

4. *Q. engelmannii* Greene. MESA OAK. Spreading tree 15 to 40 feet high, with trunk  $\frac{1}{2}$  to 3 feet in diameter; leaves blue-green, oblong, obtuse, entire or sometimes toothed,  $\frac{3}{4}$  to 3 inches long, but most commonly  $1\frac{1}{4}$  to  $1\frac{3}{4}$  inches long,  $\frac{5}{8}$  to 1 inch wide; acorns 1 or 2 in a place, ripe in first autumn; cup  $\frac{3}{4}$  inch broad, shallow or sometimes bowl-shaped, with warty scales, enclosing nearly  $\frac{1}{2}$  the nut which is subcylindric,  $\frac{1}{2}$  inch long and about as thick, or 1 inch long, relatively less thick and sometimes acute.

Low hills of San Diego Co., 15 or 20 miles from the sea (where it is abundant) to Oak Knoll (near Los Angeles) and San Gabriel. It ranges south into

northern Lower California. The leaves persist until the appearance of the new leaves in the spring, whence the folk name "Evergreen White Oak."

Refs.—*QUERCUS ENGELMANNII* Greene, West. Am. Oaks, p. 33, pl. 15, figs. 2, 3, pl. 17; Abrams, Fl. Los Angeles, p. 105. *Q. oblongifolia* Engelm. in Bot. Cal. vol. 2, p. 96 in part.

5. *Q. dumosa* Nutt. SCRUB OAK. Shrub, 2 to 8 feet high, with tough rigid branches and branchlets; leaves typically oblong to elliptic or roundish, entire or more commonly coarsely and irregularly spinose or sinuate-lobed with sharply cut or angular sinuses,  $\frac{3}{4}$  to 1 inch long; acorns ripe in first autumn, usually borne in clusters of 2 or 3; cup shallowly or deeply saucer-shaped, 5 to 8 lines broad, 2 to 5 lines deep, often rusty, the scales tuberculate, sometimes so regularly so as to suggest a quilted cushion; nut oval, cylindric, or somewhat conical,  $\frac{3}{4}$  to  $1\frac{1}{8}$  inches long.

Montane shrub, an important member of the chaparral communities in Southern and Lower California, ranging northward through both the Coast Ranges and Sierra Nevada, more or less abundant in the middle and southerly parts of those ranges. Highly variable in leaf outline, texture and indentation of margin. Equally eccentric in shape and size of both nuts and cups. Stump sprouts from fire-killed shrubs also afford remarkable and interesting series in leaf variability (W.L.J. nos. 2699, 2700, 2701, coll. in San Carlos Range). Type collected at Santa Barbara by Thos. Nuttall.

Var. *turbinella* Jepson, n. comb. (*Quercus turbinella* Greene). GREY OAK. Small shrub; leaves pale on both surfaces, glabrous, finely reticulate below, oblong to broadly elliptic, rigid but brittle, spinosely dentate,  $\frac{3}{4}$  to 1 inch long; cups gray, rather shallow, 5 to 7 lines in diameter, their scales closely woven, puberulent but not at all or scarcely tuberculate; nuts slender ovate, acute, 5 lines in diameter and about 1 inch long, the shell within quite glabrous.—Inner South Coast-Range from the Rancho Cantua (S. C. Lillis) southward to Frazier Mt. (R. S. Baldwin); Campo, San Diego Co., and neighboring Lower California (type loc., G. W. Dunn).

Var. *alvordiana* Jepson, n. comb. (*Quercus alvordiana* Eastwood). BRITTLE-LEAF OAK. Leaves thickish, obscurely but seemingly densely tomentulose beneath, entire or irregularly and coarsely serrate, oblong, 10 to 15 lines long; cup 4 to 7 lines in diameter, 2 to 3 lines deep, turbinate-cupuliform, small for the thickness of the nut, its scales ovate, acute, flat or only slightly thickened towards the base; nut very long and narrow,  $1\frac{1}{8}$  inches long,  $\frac{1}{2}$  inch in diameter at widest part, tapering gradually to apex.—San Emigdio Cañon, Coast Ranges of Kern Co., Miss A. Eastwood, November 2, 1894, type. Diagnosis derived entirely from type specimen in the California Academy of Sciences. The same thing in excellent material sent by S. C. Lillis is found in the San Carlos Range 130 miles northerly. In that district it occurs at about 1,400 feet altitude, is confined to a red shale, and from a point on the headwaters of an easterly branch of Los Gatos Creek in section 20, township 19 south, range 15 east, it extends northwest along the red shale band of the Cantua region for about 18 miles until this formation dips into the San Carlos Range.

Refs.—*QUERCUS DUMOSA* Nuttall, Sylva, vol. 1, p. 7 (1842). *Q. turbinella* Greene, West. Am. Oaks, pp. 37 (1889), 59, t. 27 (1890). *Q. alvordiana* Eastwood, Cal. Acad. Sci. Occ. Pap. no. 9, p. 48, pl. 27, fig. 4 (1905).

6. *Q. durata* Jepson n. sp. LEATHER OAK. Low spreading shrub with rigid branches, 2 to 5 feet high; foliage and branchlets closely woolly when young,



at least minutely so in age; leaves oval, dentate with equal or nearly equal prickly teeth, the upper surface convex with more or less revolute margin, 1 to  $1\frac{3}{4}$  inches long; cup 8 to 9 lines broad, 4 to 5 lines deep, the scales strongly tuberculate; nut short thick cylindric, obtuse, 7 to 9 lines long.—(*Frutex humilis extendens, ramis rigidis, 2 ad 5 ped. alta; folia et ramula juniora dense tomentulenta; folia ovala, dentibus muricatis aequalibus, supra convexa, margine plus vel minus revoluta; cupula poculiforma, 8 ad 9 lin. in diametro, 4 ad 5 lin. in alto, squamis tuberculatis; glans cylindrica brevis crassa obtusa, 7 ad 9 lin. longa*).

San Carlos Range, 2,500 to 5,000 feet, W.L.J. no. 2719, May, 1907; S. C. Lillis, Oct., 1908. Forms extensive pure thickets on the higher slopes and summits. *Quercus dumosa*, which is also abundant in the same region but chiefly at lower altitudes, has lost by the end of April all its old leaves and in early May bears only leaves of the new growth. *Quercus durata*, at that time, still retains its old leaves and shows no sign of new growth. Its leaves are so hardened that even on exposed slopes the foliage seems insensible to the extremes of both seasons; some leaves persist at least two years.

Refs.—*QUERCUS DURATA* Jepson. Probably *Q. dumosa* var. *bullata* Engelm., *Trans. St. Louis Acad.* vol. 3, p. 393 (1877) as to New Idria and perhaps as to other types cited.

7. *Q. sadleriana* R. Br. Campst. DEER OAK. Bush, mostly 2 or 3 but even 8 feet high, with several slender stems from the base; leaves persistent through the winter and until after the new leaves appear in the next summer, oblong-ovate to broadly ovate, 3 to  $4\frac{1}{2}$  inches long, the lateral nerves regular and parallel, prominent on the under surface and ending in the teeth of the margin; stipules oblanceolate,  $\frac{1}{2}$  to  $\frac{3}{4}$  inch long, fur-like on account of their dense covering of rusty hairs and persisting as long or even longer than the leaves; staminate catkins simple (rarely in clusters of 2 or 3 on a common peduncle), 1 to 2 inches long; calyx-border hairy and much cleft; stamens varying from 5 to 17, even on one bush; pistillate flowers solitary in the upper axils of the shoot; acorns maturing in first autumn; cup cup-shaped, thin; nut oval, about  $\frac{3}{4}$  inch long.

High mountains from Trinity Summit, Humboldt Co. (W.L.J. no. 2033), to Coos Co., Oregon, forming extensive pure colonies on Marble Mt., Klamath Range and the Siskiyou. Shade tolerant and very common in the White Fir forests. Browse shrub, the foliage greedily favored by mules; acorns sweet and palatable, and eaten by deer and bear, whence the folk names Deer Oak and Bear Oak. Most restricted in range of any Californian oak.

Refs.—*QUERCUS SADLERIANA* R. Br. Campst., *Ann. Mag. Nat. Hist.* ser. 4, vol. 7, p. 249 (1871). Type loc. Crescent City trail between Sailors' Diggings in Oregon and Smith River in California, *Robert Brown*, Sept., 1865. First collected by John Jeffrey in southern Oregon, 1852-3 (teste spm. in Herb. Royal Botanic Garden, Edinburgh, *W. L. J.*).

8. *Q. tomentella* Engelm. ISLAND OAK. Round-headed tree 25 to 40 feet high; leaves elliptic to oblong, tomentose or glabrate and light green above in age, strongly parallel-nerved beneath, 2 to  $3\frac{1}{2}$  inches long; cup 1 to  $1\frac{1}{2}$  inches wide,  $\frac{1}{2}$  to  $\frac{3}{4}$  inch deep, its scales imbedded in a dense tomentum but the tips free; nut subglobose, bluntish, 1 inch long.

Santa Cruz, Santa Rosa, Santa Catalina and San Clemente islands of the Santa Barbara group; Guadalupe Island (type loc.). Strictly insular. Sub-species of the next.

Refs.—*QUERCUS TOMENTELLA* Engelm., *Trans. St. Louis Acad.* vol. 3, p. 393 (1877), in *Bot. Cal.* vol. 2, p. 97 (1880); Sargent, *Silva N. Am.*, vol. 8, p. 109, t. 402 (1895).

9. *Q. chrysolepis* Liebm. MAUL OAK. (Fig. 65.) Tree commonly 15 to 60 feet high or on exposed mountain summits reduced to a mere shrub a few feet high; trunk 1 to 5 feet in diameter, the whitish bark about  $\frac{1}{2}$  inch thick and fissured into narrow flat, more or less scaly ridges; leaves thick, green above, yellow beneath with a fine fuzz or powder, or eventually lead-color or dull white, ovate or oblong-ovate, acute at apex, entire, or with entire and toothed leaves frequently found on the same twig, commonly 1 to 2 but sometimes even 4 inches long; staminate catkins  $\frac{1}{2}$  to 2 inches long; calyx unequally lobed; stamens 8 to 10; pistillate flowers mostly sessile and solitary, or sometimes in short spikes; acorns maturing in second autumn; typical cup thick and round-edged with a fine fuzzy or felt-like tomentum concealing the scales, the whole suggesting a yellow turban, but thinnish cups and scanty pubescence not concealing the scales occur as frequently; nut ovate, globose, or cylindric, rounded at apex or sharply pointed, 1 to  $1\frac{1}{4}$  inches long,  $\frac{3}{4}$  to 1 inch broad.

Cañons, mountain slopes and plateaus: Sierra Nevada, most common between 1,500 and 5,000 feet, but round balls of Maul Oak shrubs grow on the talus and walls of the Yosemite, Tehipite, Kings, Kern and other cañons to an altitude of 5,000 to 9,000 feet; not on Mt. Shasta; Coast Ranges (in every mountain range of this region), attaining its finest development in Mendocino and Humboldt cos., where truly massive trees grow on shoulders of the mountain slopes or cañon bottoms; Southern California, on all the higher mountains; extends north to southern Oregon, south to Lower California and east to New Mexico. Has a greater geographical range and grows under greater variety of conditions than any other of our species of this family. Occurring in open stands and usually as much scattered trees. Extremely variable in size, appearance and foliage characteristics. Wood remarkable for its strength, toughness and close grain which makes it suitable for mauls, tool-handles and wagon-parts. Woodsmen know it as Spanish Oak, Valparaiso Oak, Georgia Oak, Florida Oak, Iron Oak, Pin Oak, Hickory Oak, White Live Oak, Mountain Live Oak, Drooping Oak, Golden Oak, Cañon Oak and Laurel Oak. The numerous folk names are due to popular appreciation of its wood qualities but also in part to its variable form. The following are some of the extreme forms.

*Forma grandis* Jepson n. form. (Fig. 65d.) Tall tree with straight trunk and narrow crown 60 to 110 feet high; cups 6 to 8 lines broad and 4 lines deep, the scale-tips not involved in the dense close felt which is scantier than in the type; nuts oblong, 1 to  $1\frac{1}{8}$  inches long, obtusish or subacute.—(Arbor alta, truncus recto coma angusta 60 ad 110 ped. alta; cupula 6 ad 8 lin. lata, 4 lin. alta; apices squamarum non involuti, densa artaque coacta quæ est minor quam in typo; glandes oblongæ 1 ad  $1\frac{1}{8}$  poll. latæ, obtusiusculæ vel subacutæ).—Narrow North Coast Range cañons, fine examples in Mill Creek Cañon near Ukiah (W.L.J. no. 2416).

*Forma pendula* Jepson n. form. Broad-crowned tree with pendulous branchlets; leaves oblong-lanceolate to broadly lanceolate, 2 to 4 inches long,  $\frac{1}{2}$  to 1 inch broad, disposed to be entire, deep shining green above.—(Arbor coma lata ramulis pendulis; folia oblongo-lanceolata ad late lanceolata, 2 ad 4 poll. longa,  $\frac{1}{2}$  ad 1 poll. lata, plerumque integra, atrovirentia nitida supra).—Upper San Benito River (W.L.J. no. 2705, May, 1907). Similar and probably identical forms occur in El Dorado and Amador cos.

Forma **hansenii** Jepson n. form. (Fig. 65e.) Low tree; leaves ovate, acute,  $\frac{3}{4}$  to  $2\frac{1}{2}$  inches long, the nerves below chiefly straight, regular and parallel; nut cylindric, about 10 lines long, 3 or 4 lines in diameter, set in a thick cup of greater diameter.—(Arbor parva; folia ovata acuta  $1\frac{3}{4}$  ad  $2\frac{1}{2}$  poll. longa; nervi subtus plerumque recti, regulares parallelique; glans cylindrica circa 10 lin. longa, 3 vel 4 lin. in diametro, posita in crassa cupula maioris diametri).—Pine Grove, Amador Co., 2,300 feet, Geo. Hansen, 1905.

Forma **nana** Jepson n. form. (Fig. 65f.) Low compactly branched shrub; leaves oblong or ovate, acute, 1 to  $1\frac{1}{2}$  inches long; cup shallow, 7 or 8 lines



FIG. 65. *QUERCUS CHRYSOLEPIS* Liebm. a, Entire leaf; b, toothed leaf; g, small toothed leaf typical of stump sprouts; c, acorn with turban-like cup. d, Forma **GRANDIS** Jepson, acorn. e, Forma **HANSENI** Jepson, acorn. f, Forma **NANA** Jepson, leaf. nat. size.

broad; nut thick, ovate, blunt,  $\frac{3}{4}$  to 1 inch long.—(Frutex humilis dense ramosus; folia oblonga vel ovata, acuta, 1 ad  $1\frac{1}{2}$  poll. longa; cupula brevis 7 vel 8 lin. lata; glans crassa ovata obtusa,  $\frac{3}{4}$  ad 1 poll. longa).—Mt. St. Helena summit, W.L.J.

Refs.—*QUERCUS CHRYSOLEPIS* Liebm., Dansk. Vidensk. Selsk. Forhandl. 1854, p. 173, type from mountains near Carmel, Hartweg; Jepson, Fl. W. Mid. Cal. 143 (1901). *Q. oblongifolia* R. Br. Campst. Ann. & Mag. Nat. Hist. ser. 4, vol. 7, p. 252 (1871), not Engelman, teste W.L.J. While none of Robert Brown's oak specimens were found by the writer either at Edinburgh or Kew herbaria, Brown ticketed a Jeffrey specimen of *Q. chrysolepis* at Edinburgh as "*oblongifolia* Torr."

10. *Q. vaccinifolia* Kell. HUCKLEBERRY OAK. Shrub, prostrate or erect and 2 to 6 feet high, the slender pliable branchlets in tufts at top of stems, simulating the habit of a huckleberry; leaves oblong-ovate, mostly obtusish

or only sub-acute, commonly entire, pale green above, often tan-color beneath, mostly  $\frac{3}{4}$  to  $1\frac{1}{8}$  inches long or less; stamens 6 to 11; acorns small; cup broadly turbinate or shallowly bowl-shaped, thinnish, not fulvous-tomentose but merely pubescent, 3 to 4 lines broad; nut globose-ovate, rather abruptly drawn down to a sharp point, 4 to 6 lines long, 4 to 5 lines broad.

Sierra Nevada, exposed summits and slopes 6,000 to 9,000 feet; high North Coast Ranges from the Trinity Mts. northwesterly to the Klamath Range, Marble Mt. and the Siskiyou. Commonly forming extensive thickets and valuable as a protective cover against destructive runoff.

Refs.—*QUERCUS VACCINIFOLIA* Kellogg, Proc. Cal. Acad. vol. 1, p. 96 (1855); Merriam, Biol. Sur. Mt. Shasta, p. 142 (1899). *Q. chrysolepis* var. *vaccinifolia* Engelm., Trans. St. Louis Acad. vol. 3, p. 393 (1877), in Bot. Cal. vol. 2, p. 97 (1880). Commonly regarded as a variety of the preceding species but well-enough defined geographically and taxonomically to be taken as a convenient subspecies.

11. *Q. palmeri* Engelm. PALMER OAK. Rigidly branched shrub 5 to 15 feet high; leaves roundish ovate to orbicular, wavy-spinose, undulate, coriaceous and stiff, olivaceous above, pale or whitish beneath,  $\frac{1}{2}$  to  $1\frac{1}{2}$  inches long, when young sparingly pubescent on the upper surface and with a dense but thin yellowish or later white felt on the lower surface; cup thinnish, subturbinate but shallow, rusty on outside, densely silky on inside, 5 to 7 lines broad, 3 to 5 lines deep; nut ovate, 1 inch long, the shell densely woolly within; cotyledons purple, separable.

San Jacinto Range (Vandeventers Ranch) to San Diego Co. (Larkens Station) and southward a short distance over the border of Lower California. A subspecies of *Q. chrysolepis*.

Refs.—*QUERCUS PALMERI* Engelm., Trans. St. Louis Acad. vol. 3, p. 393 (1877); type loc. "mountains 80 miles east of San Diego," Dr. Edw. Palmer; Bot. Cal. vol. 2, p. 97 (1880). *Q. chrysolepis* var. *palmeri* Engelm., Bot. Cal. l. c. as synonym.

12. *Q. agrifolia* Neé. COAST LIVE OAK. Low broad trees, usually 20 to 35 feet high, but even 60 or 70 feet high, the short trunk 1 to 4 feet in diameter, parting into erect limbs or more commonly into crooked widely spreading branches whose extremities often touch or even trail the ground; bark smooth and beech-like, or sometimes fissured, dark brown or gray on the surface, reddish or pink inside, very brittle when fresh, 1 to  $2\frac{1}{4}$  inches thick; leaves roundish, elliptic, sometimes ovate or oblong, usually with spine-tipped teeth or entire, commonly 1 or 2 inches long but varying from  $\frac{1}{2}$  to 4 inches, usually convex above; staminate catkins 1 to  $1\frac{1}{2}$  inches long, deep red; stamens 4 to 8; pistillate flowers with acorns 1 in a place or in clusters of 2 to 5, maturing in the first autumn; cup broadly turbinate, 4 to 7 lines deep, embracing the base of the nut; nut usually slender ovate, 1 to  $1\frac{1}{2}$  inches long, 5 to 7 lines thick.

Valleys and hill slopes: North Coast Ranges from Cloverdale, Napa Valley and Suisun Valley (W.L.J. no. 3075) to Marin Co.; Oakland Hills and Mt. Diablo through all the South Coast Ranges to Lower California; in Southern California from the coast east to the San Jacinto Range at 4,000 feet. Abundant in the Santa Clara, Gilroy, Salinas and numerous other Coast Range valleys southward, often growing by itself and forming beautiful open groves on the valley floors. Wood used for fuel and the bark for tanning.

Refs.—*QUERCUS AGRIFOLIA* Neé, An. Cien. Nat. vol. 3, p. 271 (1801), type loc. Monterey; Greene, Erythea, vol. 2, p. 44 (1894); Jepson, Erythea, vol. 7, p. 131 (1899), Fl. W. Mid. Cal. p. 143 (1901).

13. *Q. wislizenii* DC. INTERIOR LIVE OAK. Round-headed tree most commonly 30 to 75 feet high; trunk 1 to 3 feet in diameter with a thick brittle bark which is very smooth or sometimes roughly fissured; leaves typically oblong (varying to elliptic, ovate or ovate-lanceolate), either tapering to apex or rounded, 1 to  $2\frac{1}{2}$  (or  $4\frac{3}{8}$ ) inches long, glabrous, green and shining above, pale yellowish green below, the margin entire or spiny-toothed; staminate catkins 2 to 3 inches long, sometimes borne in great profusion, 30 to 40 from a cluster of terminal buds; calyx-lobes 4 or 5, hairy pubescent; stamens 4 to 8; acorns ripe in second autumn, borne in clusters of 2 or 3 or singly; cup deeply cup-shaped to hemispherical, embracing  $\frac{1}{4}$  to  $\frac{1}{2}$  the nut, 6 or 7 lines broad, its scales thin, red-brown; nut cylindric and tapering to the apex or conical, often longitudinally banded with dark lines converging at the summit,  $1\frac{1}{4}$  to  $1\frac{5}{8}$  inches long.

Foothills and valleys from Shasta Co. and Lassen Peak, southward in the Sierra Nevada, Sacramento and San Joaquin valleys to Fort Tejon; North Coast Ranges from Twin Sisters Peak and the Vaca Mts. north along the inner range to Cottonwood Creek (Tehama Co.) and west to Ukiah Valley; also Kidder Creek, Siskiyou Co., acc. Geo. D. Butler. Attains its best development on the east side of the Great Valley where it is scattered singly or in small clusters along the fertile benches of the American, Mokelumne, Tuolumne and other rivers; the large dense crowns, as if like great globes resting on the ground with a segment cut off the lower side, evoke the admiring interest of the traveler.

Forma *extima* Jepson n. form. Acorns remarkably small but uniform; cup 3 or 4 lines deep; nut 8 or 9 lines long, 3 lines thick.—(Glandes parvae notabiliter sed constantes; cupula 3 ad 4 lin. in altitudine; glans 8 vel 9 lin. longa, 3 lin. in diametro).—Kaweah River basin, 4,000 feet altitude, Walter Fry.

Var. *frutescens* Engelm. Intricately and stiffly branched shrub 3 to 7 feet high with small leathery leaves.—High mountain summits of the Coast Ranges (1,000 to 4,000 feet): The Terraces near Ukiah (W.L.J. no. 2243), Elk Mt. and Mt. Konokti (Lake Co.), Vaca Mts., Mt. St. Helena, Mt. Tamalpais, Mt. Diablo, Mt. Hamilton and Santa Cruz Mts.; southward to the Sierra Madre, San Bernardino and San Jacinto ranges in Southern California at 5,000 to 7,000 feet altitude.

Refs.—*QUERCUS WISLIZENII* A. DeCandolle, Prodr. vol. 16, pt. 2, p. 67 (1867), type loc. American River, Dr. F. A. Wislizenius; Jepson, Fl. W. Mid. Cal. p. 144 (1901).

14. *Q. kelloggii* Newb. CALIFORNIA BLACK OAK. Graceful tree, commonly 30 to 85 feet high, with trunk 1 to  $4\frac{1}{2}$  feet in diameter and mostly erect or ascending main branches; bark black or dark, on old trunks deeply checked into small plates; leaves deeply and mostly sinuately parted with about 3 lobes on each side ending in 1 to 3 or more coarse bristle-tipped teeth, lustrous green above, lighter beneath, often white with a fine tomentum when young, 4 to 10 inches long and  $2\frac{1}{2}$  to 6 inches wide; staminate catkins  $1\frac{1}{2}$  to 3 inches long; calyx with 4 or 5 scarious lobes, stamens 5 to 9; pistillate flowers borne singly or 2 to 7 on a peduncle 3 to 8 lines long; acorns ripe in the second autumn (early in the second summer nuts completely covered by the cups, forming globose knobs about  $\frac{1}{2}$  inch in diameter); cup large,  $\frac{3}{4}$  to 1 inch deep,  $\frac{3}{4}$  to  $1\frac{1}{8}$  inches broad, covered with thin scales which have a membranous and sometimes ragged margin; nut typically oblong in outline, very



rounded at apex, 1 to  $1\frac{1}{4}$  inches long and  $\frac{3}{4}$  inch broad, covered at first with a fine fuzz and deeply set in a brown cup.

Valleys, mountain ridges and swales: Sierra Nevada, chiefly between 1,500 and 4,500 feet at the north and 3,500 to 6,500 feet at the south, either as scattered trees or in considerable groves near the lower limits of Yellow Pine; Coast Ranges, widely distributed both in the foothills and higher mountains, associated with Madroña, Blue Oak, Oregon Oak, Yellow Pine or Tan Oak, but not found in the Redwood Belt; Southern California, on all the higher ranges as far as the Cuyamaca Mts.; extends north to central Oregon. Extreme altitudinal range (in central California) 200 to 8,000 feet. Next to Maul Oak it is more widely distributed than any other oak in the State. It attains its best development in rich deep soil of ridge summits of central and eastern Mendocino and Humboldt cos., where truly splendid groves are found. Near Saratoga, Santa Clara Co., is a locally famous individual, almost perfectly symmetrical, 88 feet tall, the crown with a spread of about 90 feet, its branches sweeping nearly to the ground throughout its circumference; the trunk at 4 feet from the ground is 5 feet in diameter. Wood of Black Oak is pale red, fine-grained, brittle. Also called Kellogg Oak.

Refs.—*QUERCUS KELLOGGII* Newberry, Pac. R. Rep. vol. 6, pp. 28, 89, fig. 6 (1857). *Q. tinctoria* var. *californica* Torrey, Pac. R. Rep. vol. 4, pt. 5, p. 138 (1856). *Q. californica* Cooper, Smithsonian Rep. 1858, p. 261 (1859); Jepson, Fl. W. Mid. Cal. p. 144 (1901).

*Q. MOREHUS* Kellogg. Tree 25 to 50 feet high; leaves oblong to elliptic,  $2\frac{1}{2}$  to 4 inches long, sinuately but rather shallowly lobed, the lobes pointing upward and spinose-tipped; cups similar to those of *Q. wislizenii* or more cup-shaped; nuts cylindrical, about 1 inch long, 6 or 7 lines thick, minutely pubescent.—Occasional throughout the Sierra Nevada, 2,500 to 5,000 feet; Napa Range; Mayacamas Range; seaward Coast Range from Walker Valley to Mt. Tamalpais. Here considered as a hybrid between *Q. kelloggii* and *Q. wislizenii*. (*Q. morehus* Kellogg, Proc. Cal. Acad. vol. 2, p. 36.—1863; Greene, West Am. Oaks, pp. 3, 79, t. 2,—1889; Sudworth, Trees Pac. Slope, p. 311,—1908).

## 2. *PASANIA* Miq. TAN OAK.

Trees or shrubs with evergreen leaves and erect catkins. Staminate flowers one in a place, densely disposed in elongated simple erect catkins; stamens 8 to 10, four times as long as the 5-parted calyx. Pistillate flowers 1 in an involucre, the involucre few at the base of some of the staminate catkins; calyx often with rudimentary stamens; ovary 3-celled. Fruit an acorn, the cup with slender spreading scales.—*Pasania* (native name of one of the species in Java), a genus equally related to *Quercus* (the oaks) and *Castanea* (the chestnuts), is represented by one species in California and Oregon and by nearly one hundred in southern Asia and the Malay Archipelago. Both *Quercus* and *Castanea* are ancient types geologically and *Pasania* is of great interest as a connecting genus which has also survived to the present day.

1. *P. densiflora* Oerst. TAN OAK. Forest tree commonly 40 to 100 but even 150 feet high, the trunk 1 to 4 feet in diameter, clear of branches for 15 to 70 feet and running through to the summit of the cone-like crown; bark on young trunks white-mottled, on old trunks brown, red inside, smoothish on the surface or roughly checked into small plates; leaves oblong to elliptic-oblong, 2 to 5 inches long, 1 to 2 inches wide, densely whitish, tomentose when young, the lateral nerves parallel, very conspicuous on the under side and ending in



the teeth of the margin or the margin sometimes entire; catkins scattered singly in the axils of the leafy shoot of the season, or congested on several short subterminal leafless shoots and thus making a dense cluster of 25 or 50; catkins either wholly staminate or with a few pistillate flowers towards the base, erect, very tomentose, 3 to 5 inches long; staminate flowers consisting of about 10 stamens, 3 or 4 times as long as the woolly usually 5-lobed calyx; pistillate flower with an inferior ovary, 3 styles and a few rudimentary stamens; acorns maturing at the end of the second season; cup shallow or almost flat,  $\frac{7}{8}$  to  $1\frac{1}{8}$  inches in diameter, covered with narrowly linear or subulate spreading scales; nut oval, varying to subglobose or subcylindric,  $\frac{3}{4}$  to  $1\frac{1}{2}$  inches long, the shell densely tomentose within, at first finely tomentose without.

Outer North Coast Range, sea-level to 5,000 feet, associated with the Redwood but attaining its best development on the eastern margin of the Redwood Belt in Mendocino and Humboldt cos., ranging east to Cobb Mt. and the Napa Range and south to Marin Co., Santa Cruz, Santa Lucia and Santa Inez mts., as far south as the vicinity of Nordhoff. Lower Klamath River through Del Norte and western Siskiyou into Oregon as far as the Umpqua River. Sierra Nevada in scattered localities from Lassen Peak to Devil's Gulch, Mariposa Co. Highly valued for its bark which is used in large quantities by the California tanneries. After the tree is stripped of bark, about 90,000 trunks 10 to 110 feet long and  $\frac{1}{2}$  to 4 feet in diameter are left to rot on the ground annually. Commercial utilization of the wood is a problem needing immediate solution.

Forma *lanceolata* Jepson n. form. Leaves lanceolate, entire or with few small teeth,  $2\frac{1}{2}$  to  $3\frac{1}{2}$  inches long.—(Arbor alta, folia lanceolata integra vel dentibus parvibus,  $1\frac{3}{4}$  ad  $3\frac{1}{2}$  poll. longa).—Central Mendocino, W.L.J. no. 2234; South Fork Smith River, no. 2887.

Var. *echinoides* Sargent. SCRUB TAN OAK. Low or spreading shrub 1 to 10 feet high; leaves thick, entire, 1 to 2 inches long,  $\frac{1}{3}$  to  $\frac{7}{8}$  inch wide, the nerves often inconspicuous; acorns 1 to 4 in a place; cups very bur-like, the subulate or filiform scales recurving; nuts roundish, small, very shortly pointed.—About Mt. Shasta, westward to the Klamath Range and through the Siskiyou to southern Oregon; abundant in the Shelley Creek region of Del Norte Co. (W.L.J. no. 2910).

Refs.—PASANIA DENSIFLORA Oersted, Vidensk. Medd. For. Kjobenh. p. 83 (1866). *Quercus densiflora* Hooker & Arnott, Bot. Beechey, p. 391 (1841); Hooker, Icon. t. 380 (1841); Engelmann in Bot. Cal. vol. 2, p. 99 (1880); Jepson, Fl. W. Mid. Cal. p. 144 (1901). Var. *ECHINOIDES* Sargent, Silva N. Am. vol. 8, p. 183 (1895). *Q. echinoides* R. Br. Campst., Ann. & Mag. Nat. Hist. ser. 4, vol. 7, p. 251 (1871).

### 3. **CASTANOPSIS** Spach. CHINQUAPIN.

Trees or shrubs with evergreen leaves and branchlets lengthening by a terminal bud. Catkins slender, erect. Staminate flowers in clusters of 3, disposed on elongated, sometimes branching catkins; calyx 5 or 6-parted; stamens 6 to 12; ovary rudiment present. Pistillate flowers 1 to 3 in an involucre, the involucres on shorter catkins or sometimes scattered at the base of the staminate catkins; calyx 6-cleft with abortive stamens on its lobes; ovary 3-celled with 2 ovules in each cell; styles 3. Fruit maturing in the second season, the spiny involucre enclosing 1 to 3 nuts. Nuts ovoid or globose, more or less angled, usually 1-seeded.—Two species on the Pacific Coast of North

America and about 25 in southeastern Asia. (Greek *kastanea*, chestnut, and *opsis*, resemblance.)

1. *C. chrysophylla* A. DC. GIANT CHINQUAPIN. Singular forest tree 15 to 115 feet high, the unbranched shaft clear of branches for about one-half its height; branches short, forming a narrow crown rounded at summit or in age more or less broken; trunk 2 to 6 feet in diameter; bark fibrous, 3 inches thick, reddish in color but brown or dull gray on the surface and separated by deep furrows into heavy rounded ridges which are sparingly confluent; leaves oblong, tapering to base and also to the apex (often abruptly long-pointed), entire, dark green on the upper surface, at first golden with a fine tomentum below, later light olive-yellow,  $2\frac{1}{2}$  to 6 inches long,  $\frac{3}{4}$  to  $1\frac{3}{4}$  inches wide, nerves straightish, forking well inside the margin; catkins in more or less paniced clusters at the ends of the branches; staminate catkins simple or branching, 1 to 4 inches long, the flowers in clusters of 3 to 5, subtended by minute bracts; stamens 6 to 10, much surpassing the calyx; pistillate flowers 1 to 3 in an involucre, the involucre borne in shorter catkins or sometimes at the base of the staminate catkin; burs spiny, chestnut-like, irregularly 4-valved, containing 1 or sometimes 2 subtriangular nuts 4 or 5 lines long with hard shell and sweet kernel.

Ridges in the Redwood Belt of Mendocino and Humboldt cos. and far northward to the Coast Ranges and Cascades of Oregon and Washington. Attains its greatest size in central and southern Mendocino (Willits, W.L.J. no. 2412, Sherwood, no. 2195), where trees 70 to 115 feet high and 2 to 6 feet in diameter are scattered at rather long intervals through the forest.

Var. *minor* A. DC. GOLDEN CHINQUAPIN. Shrub 2 to 15 feet high; leaves 2 to 3 inches long, very golden beneath, often trough-shaped above; catkins profuse.—Monterey (W.L.J. no. 2992), Santa Cruz Mts. (type loc.), Mt. Tamalpais, Mendocino White Plains and northward to the south fork of the Salmon River, passing into the species.

Refs.—*CASTANOPSIS CHRYSOPHYLLA* A. DeCandolle in Seeman's Jour. Bot. vol. 1, p. 182 (1863), Prodr. vol. 16, pt. 2, p. 109 (1864); Watson, Bot. Cal. vol. 2, p. 100 (1880) in part; Sargent, Silva N. Am. vol. 9, p. 3 (1896) in part. *Castanea chrysophylla* Douglas, in Hook. Fl. Bor. Am. vol. 2, p. 159 (1853), Comp. Bot. Mag. vol. 2, p. 127 (1836), type loc. Oregon Cascades near Grand Rapids of the Columbia River, Douglas; Jepson, Fl. W. Mid. Cal. p. 145 (1901) in part. Var. *MINOR* Benth., Pl. Hartw. p. 337 (1857); DeCandolle sub *Castanopsis chrysophylla*, Prodr. vol. 16, pt. 2, p. 110 (1864).

2. *C. sempervirens* Dudley. BUSH CHINQUAPIN. Spreading shrub 1 to 8 feet high with smooth brown bark; leaves oblong, acute at base, acute or obtuse at apex, or sometimes tapering upwards from near the base and therefore lanceolate-oblong,  $1\frac{1}{2}$  to 3 inches long and 5 to 11 lines broad; catkins simple, 5 to 20 in a rather dense terminal cluster, 1 to  $1\frac{1}{2}$  inches long, the upper with pistillate flowers at the base; stamens varying from 10 to 17, rarely as few as 8; styles 3, light brown, clavate.

High rocky or gravelly mountain summits or slopes: Sierra Nevada, chiefly between 3,000 and 6,000 feet; Coast Ranges, 1,500 to 4,000 feet, as on the Vaca Mts., Mt. St. Helena, Oakland Hills, Mt. Diablo and Santa Lucia Mts.; Southern California, abundant on Sierra Madre, San Bernardino and San Jacinto ranges, 8,500 to 10,000 feet.

Refs.—*CASTANOPSIS SEMPERVIRENS* Dudley in Merriam, Biol. Sur. Mt. Shasta, p. 142 (1899). *Castanea sempervirens* Kellogg, Proc. Cal. Acad. vol. 1, p. 71 (1855), type loc. vicinity of Mariposa, Cal. L. Ransom. *C. chrysophylla* Jepson, Fl. W. Mid. Cal. p. 145 (1901) in great part.

## JUGLANDACEAE. WALNUT FAMILY.

Deciduous trees with alternate pinnate leaves and no stipules. Stamens and pistils in different flowers on the same tree, both sorts without petals. Staminate flowers borne in lateral pendulous catkins on last season's wood. Pistillate flowers terminal on the new wood, 1 to several in a cluster. Ovary inferior; styles 2, stigmatic along the inside. Fruit an incompletely partitioned nut containing a single oily seed and covered by a green and fleshy or, when fully ripe, a dry brown or black husk.—Six genera, widely distributed. The genus *Carya* of the Eastern United States is well represented by the hickories, pignuts and pecans, some of which are cultivated in California.

1. *JUGLANS* L. WALNUT.

Bark strong-scented. Branchlets hollow, divided into little chambers by pithy partitions. Buds nearly naked. Staminate flower with an irregularly 3 to 6-lobed calyx and numerous stamens. Pistillate flower with a 4-lobed calyx adherent to the ovary. Seed so lobed as to fit the irregularities of the nut.—Ten species widely distributed. Four species in the United States, two in the east, a third, *J. rupestris* Engelm., occurs from Texas to Arizona. *J. regia* L., Persian or English Walnut, is extensively cultivated in California. (Name from Jovis and glans, the nut of Jove.)

1. *J. californica* Wats. CALIFORNIA WALNUT. Tree, or sometimes a small shrub, 10 to 50 feet high, the trunk with roughish nearly black bark; leaves pinnately compound, 6 to 13 inches long; leaflets 11 to 19, oblong-lanceolate, serrate,  $1\frac{1}{2}$  to 4 inches long; staminate catkins 2 to 4 inches long, each flower with 20 to 26 stamens; fruit globose,  $\frac{3}{4}$  to  $1\frac{1}{4}$  inches in diameter; nut hard, covered with a dry brown or in age black husk which does not separate from the shell or only in an irregular or partial manner, almost smooth, but marked with a few shallow longitudinal grooves.

Dry hillsides and valley washes: Santa Barbara National Forest, Ojai Valley to cañon south of Saugus, Newberry Park and Santa Monica, thence along the Sierra Madre and San Bernardino foothills as far east as San Bernardino and south to the Brea Cañon in the Sierra Santa Ana (southernmost locality). The trunk commonly branches near or at the ground and the individuals assume a shrub-like habit; even though they may grow to very considerable size the rounded shrub-like habit generally persists. Used with us as a stock graft for the horticultural propagation of the English Walnut.

Var. *hindsii* Jepson. Tree 40 to 75 feet high; trunk straight without branches up to 10 to 25 feet, 1 to 5 feet in diameter; leaflets mostly lanceolate and acuminate, occasionally oblong-lanceolate, 2 to 3 inches long,  $\frac{1}{2}$  to 1 inch wide; fruit  $1\frac{1}{4}$  to 2 inches in diameter.—(Arbor 40 ad 75 ped. alta; truncus rectus sine ramis usque ad 10-25 ped., 1 ad 5 ped. in diametro; foliola plerumque lanceolata et acuminata, interdum oblongo-lanceolata, 2 ad 3 poll. longa,  $\frac{1}{2}$  ad 1 poll. lata; fructus  $1\frac{1}{4}$  ad 2 poll. in diametro).—Walnut Creek and Lafayette Creek, Contra Costa Co.; Lower Sacramento River near Walnut Grove; Napa Range, east slope near Wooden Valley. These northern trees were introduced by the native tribes in trading with the Indians of Southern California and are invariably found about ancient village sites.

Refs.—*JUGLANS CALIFORNICA* Watson, Proc. Am. Acad. vol. 10, p. 349 (1875); Watson, Bot. Cal. vol. 2, p. 93 (1880), as to California trees; Jepson, Fl. W. Mid. Cal. p. 146 (1901), Bull. S. Cal. Acad. vol. 7, p. 23 (1908). *J. rupestris* Torrey, Bot. Mex. Bound. p. 205 (1859), in part; Parish, Zoe, vol. 4, p. 345 (1894).

## MYRICACEAE. SWEET-GALE FAMILY.

Shrubs or small trees. Leaves fragrant, alternate, simple, resinous-dotted, without stipules. Flowers in oblong or cylindrical catkins, unisexual, solitary and sessile in the axils of sealy bracts; perianth none. Staminate flower with 4 to 16 stamens, the braetlets usually 2; pistillate flower surrounded at base by 2 to 4 small scales or braetlets; ovary 1-celled, 1-ovuled; stigmas 2, filiform, sessile. Fruit a nutlet. Seed without endosperm.

## 1. MYRICA L. WAX MYRTLE.

The only genus.—Mostly tropical, about 30 species. (Greek murike, the ancient name of the Tamarisk.)

Evergreen monœcious shrub; stamens 7 to 16, longer than the bracts; fruit waxy, berry-like.

.....1. *M. californica*.

Deciduous dioecious shrub; stamens 3 or 4, shorter than bracts; fruit a minute glabrous nutlet

.....2. *M. hartwegi*.

1. *M. californica* Cham. WAX MYRTLE. Thickly branched evergreen shrub or small tree, 8 to 25 feet high; leaves thick, dark green, glossy, oblong, or oblanceolate-oblong, tapering above to an acute apex, narrowed below to a petiole,  $2\frac{3}{4}$  to 5 inches long, remotely serrate or almost entire; flowers monœcious; pistillate catkins in the axils of the upper leaves, 3 to 5 lines long; staminate catkins below, sometimes as much as 1 inch long; androgynous catkins often occur between, with the staminate flowers at base; staminate flower consisting of 7 to 16 stamens, united by their filaments into a cluster longer than the braet; ovary ovate, stigmas bright-red, exserted; fruit globose, brownish purple, covered with a coat of whitish wax, 2 lines in diameter, the braetlets at the base minute.

Sand-dunes, moist hillsides, or rocky declivities near the ocean, from Santa Monica northward along the entire California coast and beyond our borders to Washington.

Refs.—MYRICA CALIFORNICA Chamisso in Linnaea, vol. 6, p. 535 (1831), type loc. San Francisco, Adelbert von Chamisso; Jepson, Fl. W. Mid. Cal. p. 146 (1901).

2. *M. hartwegi* Wats. SIERRA BAY. Deciduous shrub 4 to 6 feet high; leaves thin, oblong and tapering at base to a short petiole, acute at apex, serrate above the middle,  $1\frac{3}{4}$  to  $3\frac{1}{2}$  inches long,  $\frac{1}{2}$  to 1 inch wide; staminate catkins 5 to 8 lines long; stamens 3 or 4, shorter than the braets, their filaments united at base; pistillate catkins 2 lines or at length 3 to 6 lines long; nutlet less than 1 line long, smooth, glabrous, laterally subtended by 2 persistent braetlets which surpass it.

Sierra Nevada, about 5,000 feet: Big Creek near Mariposa Big Tree Grove; Rosasco's, Tuolumne Co.; northern Sierra Nevada, Theo. Hartweg, no. 1958, type (probably on Yuba River, not on the Sacramento River).

Refs.—MYRICA HARTWEGI Watson, Proc. Am. Acad. vol. 10, p. 350 (1875), in Bot. Cal. vol. 2, p. 81 (1880).

## URTICACEAE. NETTLE FAMILY.

Herbs with simple leaves. Flowers small (ours less than 1 line long), greenish, unisexual, clustered, the clusters disposed in catkin-like axillary spikes or loose axillary heads. Petals none. Staminate calyx with 4 distinct or nearly distinct sepals and as many opposite stamens, the filaments coiled or bent inward in the bud so that when released, they fly upwards like a spring, scattering the pollen. Pistillate calyx 2 to 4-toothed or -cleft, or of nearly distinct segments. Ovary

superior, 1-celled, with 1 orthotropous erect ovule; style and stigma 1. Embryo straight. Endosperm oily. Fruit an achene, always enclosed or covered by the calyx.

Leaves opposite, toothed, stipulate; hairs stinging; achene flattened.

Pistillate calyx 4-parted, the segments almost distinct, the inner ones largest...1. *URTICA*.

Pistillate calyx saccate, 2 to 4-toothed at orifice.....2. *HESPEROCNIDE*.

Leaves alternate, entire, without stipules; hairs not stinging; achene ovoid; pistillate calyx tubular, 4-cleft.....3. *PARIETARIA*.

### 1. *URTICA* L. NETTLE.

Annual or perennial herbs with stinging hairs. Leaves opposite, petioled, 3 to 7-nerved, with stipules. Flowers in ours monœcious, clustered, the clusters in axillary, often branching spikes. Staminate flower with 4 sepals, 4 stamens and a cup-shaped rudiment of a pistil. Pistillate calyx with the sepals unequal, the exterior smaller than the inner and at length enclosing the flattened achene; ovary with sessile tufted or almost feathery stigma. Endosperm scanty. (Latin name of the nettle.)

Pistillate and staminate flowers in separate spike-like inflorescences; perennial.

Herbage gray; leaves ovate to lanceolate.....1. *U. gracilis* var.

Herbage dark green; leaves broadly ovate, cordate at base.....2. *U. californica*.

Pistillate and staminate flowers mixed in the same cluster; herbage dark green; annual.....3. *U. urens*.

1. *U. gracilis* Ait. var. *holosericea* Jepson n. comb. (*U. holosericea* Nuttall). Stem erect, unbranched, 4 to 10 feet high; leaves long ovate to lanceolate, commonly green and with scattered bristles above, gray below with a short dense pubescence, coarsely serrate, 3 to 5 inches long; petioles  $\frac{1}{2}$  to 2 inches long; stipules narrowly oblong, mostly acutish, 2 to 6 lines long; flowers (as also in next) sessile in small clusters (glomerules), the clusters in dense simple or somewhat paniculately branched spikes; pistillate spikes  $\frac{1}{2}$  to 2 inches long, the staminate in axils below the pistillate and often twice as long; inner sepals not or scarcely exceeding achene; achene elliptic but acutish at apex and often at base, smooth.

Along creeks, about damp spots in the hills, in moist valleys or in marshes, common and often abundant; throughout California except in the desert regions; extends north to Washington. Ranges altitudinally from sea-level to 9,800 feet in the Sierra Nevada. From the ordinary Eastern *U. gracilis* the Californian plant differs only in its more abundant (albeit variable) pubescence and somewhat more densely flowered spikes, being more like it than the plant of the southern Rocky Mts. (*U. gracilentia* Greene). In pubescence and in amount of flower production var. *holosericea* is very variable. It has the following forms:

Forma *greenii* Jepson n. form. Herbage yellowish green; achene with very short and obscure stipe.—(*Herba flavo-viridis*; *achenium stipiti breve*).—Etna, Siskiyou Co., E. L. Greene, no. 1028.

Forma *densa* Jepson n. form. Herbage very gray; leaves on flowering portion of stem reduced, the paniculate spikes equalling or exceeding them, very numerous and forming a dense uninterrupted compound panicle.—(*Herba cana valde*; *inflorescentia paniculata duplicata densa*).—Howell Mt., W.L.J., Sept. 24, 1893; also lower Sacramento River (Andrus Island).

Refs.—*URTICA GRACILIS* Aiton, Hort. Kew. vol. 3, p. 341 (1789). *U. holosericea* Nuttall, Jour. Phil. Acad. n. s. vol. 1, p. 183 (1847), type loc. near Monterey, Gambel; Jepson, Fl. W. Mid. Cal. p. 147 (1901).

*U. BREWERI* Watson, Proc. Am. Acad. vol. 10, p. 348 (1875), type loc. Los Angeles, Brewer, no. 95 (1861). Leaves thin, finely hispid beneath, tuberculately roughened above; panicles



scarcely exceeding petioles; sepals twice longer than the broadly ovate achene.—A dubious species; origin of the type open to doubt since not found near Los Angeles by later collectors, although diligently searched for (cf. S. B. Parish in Zoe, vol. 5, p. 113,—1901). Pringle's no. 2005 (1888), State of Chihuahua, determined as this species by Watson, has a broadly ovate (in some cases almost obcordate) papillate-roughened achene as long as the inner sepals.

2. **U. californica** Greene. COAST NETTLE. Stem often branched from the base, 2 to 3 feet high, producing stolons; stems and petioles hispid and somewhat pubescent; leaves broadly ovate, deeply cordate, coarsely serrate, subglabrous above, shortly pubescent below and often gray, 3 to 4 inches long and nearly as broad, or the lower 4 to 7 inches long; petioles 1 to 3 inches long; stipules oblong to elliptical, obtuse, 3 to 6 lines long; spikes simple or paniculately branched, mostly exceeding petioles; inner sepals equalling ovate achene.

Low lands near the coast from Lake Pilearitos (San Mateo Co.) northward to Tennessee Bay and Tomales Bay (Marin Co.); Yes Bay, Alaska; probably Washington.

Refs.—*URTICA CALIFORNICA* Greene, Pitt. vol. 1, p. 281 (1889), type loc. Pt. Pietras, San Mateo Co., Greene, 1887. *U. lyallii* var. *californica* Jepson, Fl. W. Mid. Cal. p. 147 (1901). *U. lyallii* Watson, a taller more slender plant of Washington and British Columbia, has narrower thinner leaves with entire caudate apices, at base truncate or barely cordate.

3. **U. urens** L. SMALL NETTLE. Erect and simple or branching from the base, 1 to 1½ feet high, leafy to the top, very sparingly hispid; leaves elliptic or ovate, coarsely lacinate-serrate, 3 to 5-nerved, ½ to 1½ inches long, slender petioled; stipules short, about 1 line long; flowers more or less pedicelled in glomerules, the glomerules in an oblong rather dense spike often shorter than the petioles; fruiting calyx with hispid-ciliate margins.

Native of Europe, now widely naturalized in central and Southern California.

Locs.—San Diego; Ramona, T. S. Brandegee, 1894; Riverside; Pasadena; San Buenaventura, Brewer, 1861; Santa Cruz Island, Greene, 1886; Santa Barbara, Dunn, 1891; Ft. Tejon Springs; Greenfield (Kern Co.); Pacific Grove, W.L.J. 1896; Evergreen, San Jose, Santa Clara, Mayfield, acc. Dary, 1902; San Francisco; Berkeley.

Refs.—*URTICA URENS* Linnaeus, Sp. Pl. p. 984 (1753); Parish, Zoe, vol. 1, p. 125 (1890); Jepson, Fl. W. Mid. Cal. p. 147 (1901).

## 2. **HESPEROCNIDE** Torr.

Annual herbs similar to *Urtica*. Stipules minute. Staminate calyx with 4 almost distinct sepals. Pistillate calyx consisting of a membranous flattened oblong-ovate sac with a minutely 2 to 4-toothed orifice. (Greek *hespera*, west or western, and *knide*, a nettle.)

1. **H. tenella** Torr. Slender, erect or straggling, 1 or 2 feet high; stems and petioles bristly with scattered hairs, the blades very sparsely hispid; leaves thin, ovate, serrately incised, ½ to 1½ (or 2) inches long on slender petioles; flowers densely glomerate in the axils, the clusters shorter than the petioles; pistillate calyx thin, hispid with hooked hairs, in fruit ½ to less than 1 line long; achene with minutely roughened surface.

Coast Ranges from Napa Valley southward to Southern California.

Locs.—Pinole Cañon, Greene; Bushy Knob, Brewer, no. 1194; Santa Clara foothills, C. F. Baker, no. 667; Santa Monica Mts., Brauntton, no. 1274; San Bernardino, Parry & Lemmon; San Diego; San Clemente Island, acc. Davidson.

Refs.—*HESPEROCNIDE TENELLA* Torrey, Pac. R. Rep. vol. 4, p. 139 (1857), type loc. Napa Valley, Dr. J. M. Bigelow (1854); Jepson, Fl. W. Mid. Cal. p. 148 (1901).

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